

WAVERLEY ELEMENTARY SCHOOL REPLACEMENT

Frederick County Public Schools

GWWO Project No. 18045

PSC No. 10.058.21



PROJECT MANUAL

VOLUME II

Divisions 01 thru 14

BID DOCUMENTS

March 16, 2020

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Baltimore, MD 21230

Telecommunications

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END OF SECTION

SECTION 01 1000 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

- A. Project Name: Waverley Elementary School Replacement
- B. Owner's Name: Frederick County Public Schools.
- C. Architect's Name: GWWO, Inc./Architects.
- D. The Project consists of the demolition of two existing elementary schools and subsequent construction of a new 130,000 square-foot elementary school.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: Multiple prime contracts as described in Section 00 5226 - AIA Document A132/CMA, 2009 Standard Form of Agreement Between Owner and Contractor.

1.3 DESCRIPTION OF ALTERATIONS WORK

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

1.4 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner and coordinated with the Project Coordinator.

1.5 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.6 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the site is unoccupied.
2. Prevent accidental disruption of utility services to other facilities.

1.7 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner.

1.8 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01 2000 - Price and Payment Procedures.
- C. Section 01 2100 - Allowances.
- D. Section 01 2200 - Unit Prices.
- E. Section 01 2300 - Alternates.
- F. Section 01 3000 - Administrative Requirements.
- G. Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1
- H. Section 01 3553 - Security Procedures.
- I. Section 01 4000 - Quality Requirements.
- J. Section 01 4216 - Definitions.
- K. Section 01 4219 - Reference Standards.
- L. Section 01 5000 - Temporary Facilities and Controls.
- M. Section 01 5100 - Temporary Utilities.
- N. Section 01 5213 - Field Offices and Sheds.
- O. Section 01 5500 - Vehicular Access and Parking.
- P. Section 01 5721 - Indoor Air Quality Management
- Q. Section 01 5813 - Temporary Project Signage.
- R. Section 01 6000 - Product Requirements.
- S. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- T. Section 01 7000 - Execution and Closeout Requirements.
- U. Section 01 7419 - Construction Waste Management and Disposal
- V. Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 10 days after date of Owner-Contractor Agreement.
- D. Format: Utilize AIA G703 and the scoping documents provided as part of the contract package. Identify each line item with number and title of the specification section. Identify site mobilization and bonds and insurance. The Schedule of Values must be approved by the Construction Manager, Owner and Architect.

1.3 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702-CMa and Form AIA G703, edition stipulated in the Agreement.
- C. Forms filled out by hand will not be accepted.
- D. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Balance to Finish.
 - 9. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit one electronic and three hard-copies of each Application for Payment.
- I. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 3000.

2. MBE Sub Payment Verification Form.
 3. Construction progress schedule, revised and current as specified in Section 01 3000.
 4. Partial release of liens from major subcontractors and vendors.
 5. Sustainable design documentation applicable to work for which application is being made; see Section 01 3329.
 6. All supporting documentation required to justify payment for stored materials.
- J. When Architect and/or Construction Manager requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.4 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Construction Manager.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 21 days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 1. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- E. Substantiation of Costs: Provide full information required for evaluation.
- F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

1.5 APPLICATION FOR FINAL PAYMENT

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Alternates.

1.2 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.3 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 - Specialized Program Suite:
 - 1. Base Bid Item: No classrooms or support spaces for Specialized Program functions.
 - 2. Alternate Item: Suite to include two (2) classrooms and support spaces as indicated on the drawings. Reference the following drawing series for more information:
 - a. AX Series
 - b. SX Series
 - c. MX Series
 - d. PX Series
 - e. EX Series
 - f. TX Series
- B. Alternate No. 1A - Solid Surface Countertops in Specialized Program Suite
 - 1. Base Bid Item: Provide plastic laminate countertops in the Specialized Program Suite.
 - 2. Alternate Item: Provide solid surface countertops in the Specialized Program Suite.
- C. Alternate No. 1B - Luxury Vinyl Tile (LVT) in Specialized Program Suite
 - 1. Base Bid Item: Provide VCT in the Specialized Program Suite.
 - 2. Alternate Item: Provide LVT in the Specialized Program Suite.
- D. Alternate No. 1C - Copper Pipe in lieu of PEX-a piping in Specialized Program Suite
 - 1. Base Bid Item: Provide PEX-a piping in the Specialized Program Suite.
 - 2. Alternate Item: Provide copper piping in the Specialized Program Suite.
- E. Alternate No. 2 - Terrazzo at Select Corridors and Spaces:
 - 1. Base Bid Item: Vinyl Composition Tile (VCT) flooring throughout building, unless noted otherwise; not to include stair treads in B210.
 - 2. Alternate Item: Substitute resinous matrix terrazzo flooring in:
 - a. Main Street Corridor as indicated on the drawings.
 - b. Cafeteria (Room C101).
 - c. Entry Vestibules (Rooms B110 and E101).
- F. Alternate No. 3 - Luxury Vinyl Tile
 - 1. Base Bid Item: Vinyl Composition Tile (VCT) flooring throughout building, unless noted otherwise; not to include stair treads in B210.
 - 2. Alternate Item: Substitute Luxury Vinyl Tile (LVT) flooring in:
 - a. All classrooms.

- b. Spaces: A105, A205, B208, B209, B212, B213, F115, F217.
 - c. Main Street Corridor indicated as resinous matrix terrazzo on the drawings.
 - d. Corridors: A100A, A100B, A200A, A200B, B200A, C100B, E100B, F100A, F100B, F200A, F200B.
- G. Alternate No. 4 - Casework Countertops:
 - 1. Base Bid Item: Plastic Laminate countertops throughout building.
 - 2. Alternate Item: Solid Surface countertops throughout building.
- H. Alternate No. 5 - Mechanical Unit Service Contract:
 - 1. Base Bid Item: No service contract for mechanical units.
 - 2. Alternate Item: Five (5) year service contract for all mechanical units. Reference section 23 0500 - Common Work Results HVAC for more information.
 - a. Work covered under contract is to include, but not limited to:
 - 1) Changing of filters,
 - 2) Inspection of equipment, and
 - 3) Maintenance of equipment in accordance with manufacturer requirements and recommendations.
- I. Alternate No. 6 - Above Grade Domestic Water Piping (all sizes):
 - 1. Base Bid Item: PEX-a piping, fittings and associated appurtenances.
 - 2. Alternate Item: Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B) or wrought-copper solder-joint fittings; and soldered joints.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Contractor's daily reports.
- F. Progress photographs.
- G. Coordination drawings.
- H. Request for information (RFIs).
- I. Submittal schedule.
- J. Submittal administrative requirements
- K. Submittal procedures.
- L. Delegated-design services

1.2 PROJECT COORDINATION

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for vehicle and equipment access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.

5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via Newforma, which logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Procedure applies to requests for information (RFIs), and submittals for review, information, record and closeout.
 2. Construction Manager, Contractor, and Architect are required to use this service.
 3. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com).
 4. All other specified submittal and document transmission procedures apply.
- B. Submittal Service: The selected service is:
 1. ProjectSight: <https://projectsight.trimble.com/>.

3.2 PRECONSTRUCTION MEETING

- A. Project Coordinator will schedule a meeting after Notice of Award.
- B. Attendance Required:
 1. Authorized representative of Owner.
 2. Architect.
 3. Construction Manager and Contractor and its superintendent.
 4. Contractors, Prime Contractors, and Major Subcontractors.
- C. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- D. Agenda: Discuss items of significance that could affect progress, including the following:
 1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Designation of personnel representing Construction Manager, Owner and Architect.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling activities and coordination of services provided by Owner and/or a third party.

8. Use of premises by Owner and Construction Manager or Contractor.
 9. Owner's requirements and occupancy prior to completion.
 10. Construction facilities and controls by Owner.
 11. Temporary utilities and controls by Owner.
 12. Security and housekeeping procedures.
 13. Schedules.
 14. Procedures for testing.
 15. Procedures for maintain record documents.
 16. Inspection and acceptance of equipment put into service during construction period.
 17. Scheduling activities of a Geotechnical Engineer.
- E. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

- A. Project Coordinator to schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Attendees:
1. Authorized Representative of Owner.
 2. Architect.
 3. Construction Manager or Contractor.
 4. Contractors
 5. Special Consults as appropriate to agenda topics for each meeting.
 6. Major Subcontractors as appropriate to agenda topics for each meeting.
- C. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule, log, and status of submittals.
 6. Review of RFI log and status of responses.
 7. Review of off-site fabrication and delivery schedules.
 8. Maintenance of progress schedule.
 9. Corrective measures to regain projected schedules.
 10. Planned progress during succeeding work period.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to work.
- E. Project Coordinator to record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made. If revisions are requested to the minutes, revise and distribute revised minutes within two days to the same parties noted above.

3.4 CONSTRUCTION PROGRESS SCHEDULE

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

- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

3.5 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. List of separate contractors at Project site.
 - 5. Approximate count of personnel at Project site.
 - 6. Major equipment at Project site.
 - 7. Material deliveries.
 - 8. Safety, environmental, or industrial relations incidents.
 - 9. Meetings and significant decisions.
 - 10. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 11. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
 - 12. Testing and/or inspections performed.
 - 13. Signature of Contractor's authorized representative.
- B. Submit electronically to Owner and Architect monthly with application for payment.

3.6 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Excavations in progress.
 - 3. Foundations in progress and upon completion.
 - 4. Structural framing in progress and upon completion.
 - 5. Enclosure of building, upon completion.

6. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions as follows:
1. Site.
- G. Views:
1. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
 2. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
 3. Consult with Architect for instructions on views required.
 4. Provide factual presentation.
 5. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
 6. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. Digital Photographs: 24 bit color, minimum resolution of 2056 x 1920 pixels (5mp), in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Electronic document submittal service.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.

3.7 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of, but not limited to, architectural, structural, civil, mechanical, electrical, audio-visual, and fire protection systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. 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.

2. If during the coordination process, the contractor determines a conflict that requires input by the Architect, submit questions as a Request for Information.
3. Review: Architect will review coordination drawings for information only, to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

3.8 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 will reject RFIs submitted to Architect by other entities controlled by Contractor or Construction Manager.
 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 and Construction Manager.
 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 suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Prepare using software provided by the Electronic Document Submittal Service.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 calendar days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be rejected:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect'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 Section 01 2000 Price and Payment Procedures.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare and maintain a tabular log of RFIs organized by the RFI number. Provide the log at each Progress Meeting or weekly if requested by the Owner or Architect. Include the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Construction Manager.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's and Construction Manager's response was received.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

3.9 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Use of Digital Data Files: Digital data files of the Contract Drawings may be provided for Contractor's use during construction.
 1. Architect will furnish Contractor electronic copies of requested drawings in 2010 "DWG" Format for use in preparing Shop Drawings under the following conditions:
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Contract Drawings.
 - b. Contractor shall execute any and all data licensing agreements including but not limited to the form of Agreement(s) included in Project Manual.
 - c. Files will be provided through the Architect's file transfer system.
 - d. Electronic Structural Drawings will not be provided for use in producing structural steel shop drawing submittals.
 - e. The Contractor shall pay the Architect a preparation and transfer fee of \$250.00 per single "DWG" file. Note, each drawing sheet is a separate "DWG" file.
 - f. Digital data files to be furnished will be limited to the following for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.
 - 3) Site plan
 2. Building Information Model (BIM) will not be made available for Contractor's use during construction.
- 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Coordinate transmittal of submittals for related parts of the Work specified in different sections so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves 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'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 21 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 21 calendar days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 28 calendar days for initial review of each submittal.
 - 5. The following submittals will, by their nature, require additional time for review which should be factored into the schedule.
 - a. Structural Steel
 - b. Interior Architectural Woodwork
 - c. Doors, Frames, and Hardware
 - d. Aluminum-Framed Storefront/Curtainwall.
 - e. Foodservice Equipment
 - f. Automatic Temperature Control System
 - g. Interior and Exterior Lighting
- D. Electronic Submittals: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- E. Submittal Preparation:
 - 1. Use the Submittal Cover Sheet included in Project Manual.
 - 2. All submittals must have the completed LEED Submittal Summary Form included in section 01 8113 "Sustainable Design Requirements - LEED v4/v4.1" or the submittal will be immediately rejected.
 - 3. Drawing numbers, detail references, locations where product is to be installed and other necessary identification shall be provided in addition to the information required by the Submittal Cover Sheet.
 - 4. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor or Construction Manager.
 - 5. 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 compliances with approval stamp before submitting to Architect.
 - 6. Indicate Construction Manager's and Contractor's approval for each submittal. Include name of reviewer, date of Construction Manager's and Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - a. Architect will not review submittals received from Construction Manager that do not have Construction Manager's review, approval, and certifying statement.
- F. Options: Clearly identify the following:
 - 1. Proposed models or options where submitted data lists multiple models or options.
 - 2. Options requiring selection by Architect.

- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form 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 as No Exceptions Taken, Exceptions as Noted, or Reviewed for Information Only notation from Architect's action stamp.
 4. Review of submittal packages requiring more than 1 resubmittal will be deemed excess and will result in added cost per current hourly rates, to be paid by the Contractor, for the AE's review.
- I. Architect's Action: Architect will review each submittal, indicate corrections or revisions required, and return it.
1. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - a. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1) NO EXCEPTIONS TAKEN
 - 2) EXCEPTIONS AS NOTED
 - 3) REVISE AND RESUBMIT
 - 4) REJECTED
 - 5) RESUBMIT FOR RECORD
 - 6) REVIEWED FOR INFO ONLY
 2. Informational Submittals: Architect will review each submittal for information only.
 3. Architect will forward each submittal to appropriate design party. Contractor will forward each submittal to appropriate construction party .
 4. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
 5. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be rejected without review.
 6. Architect will discard submittals received from sources other than Contractor or Construction Manager
 7. Architect will discard submittals received that are not required by the Contract Documents.
- J. 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.
- K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked as No Exceptions Taken, Exceptions as Noted, or Reviewed for Information Only notation from Architect's and Construction Manager's action stamp.

3.10 SUBMITTAL PROCEDURES

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- B. 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.
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.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Electronic Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, Contractor's review stamp, and identification information for record.
 4. 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.
 5. Samples for Initial Selection: Submit physical hardcopies of the manufacturer's samples or 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 will retain one full set.

6. 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.
 - a. Number of Samples: Submit ___ sets of Samples. Architect and Construction Manager will retain ___ Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least one set(s) of paired units that show approximate limits of variations.
- D. 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. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. 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.
- F. Design Data: Prepare and submit written and graphic information, including compliance with indicated performance and design criteria in individual Specification Section. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
 2. 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.
 3. 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.
 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 6. 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 AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
 1. 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.

2. Field Test Reports: Submit written 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.
3. 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.
4. 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.
5. Product Test Reports: Submit written reports indicating that 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.
6. 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. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

3.11 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional registered in the state the project is in, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

END OF SECTION

SECTION 01 3329 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4/V4.1 FOR SCHOOLS

PART 1 GENERAL

1.1 SUMMARY

- A. This project has been designed to achieve the LEED Silver (minimum 50 points) rating as defined in USGBC LEED v4-BD+C for Schools and will be pursuing an alternate compliance path by substituting select credits with USGBC LEED v4.1-BD+C credits as identified in this section and in the attached LEED project checklist. The project is pursuing MR Building Product Disclosure and Optimization and EQ Low-Emitting Materials Credits.
 - 1. Specific requirements for LEED are also included in other Sections.
 - 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 3. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
 - 4. A copy of the LEED Project checklist is attached at the end of this Section for information only.
 - 5. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide and online amendments apply to this Section.

1.2 REPORTING REQUIREMENTS

- A. Free-standing furniture and furnishings are not included in the Contract.
- B. Contractor must familiarize himself with the relevant reporting requirements and provide the necessary information and instruction to all subcontractors and installers.
- C. Since Contractor and subcontractors may not be familiar with sustainable design requirements, this section includes a summary of the products and procedures intended to achieve sustainable design credits.
 - 1. Some credits are dependent on proper performance by Contractor and subcontractors.
 - 2. Other credits involve quantifying percentages by weight or volume and cost; these require careful recordkeeping and reporting by the Contractor.
 - 3. See www.usgbc.org for more information.

1.3 DEFINITIONS

- A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.
- B. CDPH Standard Method v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.2-2017, for the emissions testing and requirements of products and materials.
- C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.

- D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
 - 1. Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
 - 2. Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - 3. Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.
- I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.
- J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.
- L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.
- M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.
- N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.

- O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.
 - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.2 definition.

1.4 REFERENCE STANDARDS

- A. USGBC LEED v4-BD+C - LEED v4 for Building Design and Construction.
- B. USGBC LEED v4.1 BD+C - LEED v4.1 for Building Design and Construction; 2019.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.
 - 1. Contractor to provide documentation required by LEED and LEED review.
- B. Contractor to provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.
- C. Contractor shall respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. LEED Online Submittals: Contractor shall upload LEED documentation submittal data directly to USGBC project "LEED Online" website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.
- E. LEED Conference: Contractor shall schedule and conduct a conference at a time convenient to Owner and Architect within 21 days prior to commencement of the work. Advise Architect, Owner's Commissioning Authority, and Owner's Project Manager of scheduled meeting dates.
 - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
 - 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For contractor's LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Wood construction materials.
 - 2. Passive plumbing materials.
 - 3. Passive mechanical (HVAC) materials.
 - 4. Passive electrical materials.
- C. LEED Action Plan Components: Contractor shall provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:
 - 1. MRp2/MRc5, Waste Management Plan, complying with Division 01 Section "Construction Waste Management and Disposal."
 - 2. EQp1/EQc3/EQc4, Indoor Air Quality Plan, complying with Division 01 Section, "Indoor Air Quality Management."
- D. LEED Progress Reports: Concurrent with each Application for Payment, contractor shall submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
 - 1. MR Prerequisite 2 & MR Credit 5, Waste reduction progress reports complying with Division 01 Section "Construction Waste Management and Disposal."
 - 2. MR Credit 2: Building Product Disclosure and Optimization - Environmental Product Declarations.
 - 3. MR Credit 3: Building Product Disclosure and Optimization - Sourcing of Raw Materials.
 - a. General: Manufacturing locations.
 - b. Option 1: Corporate sustainability reports.
 - c. Option 2:
 - 1) Extended producer responsibility.
 - 2) Bio-based materials.
 - 3) Certified wood products.
 - 4) Materials reuse.
 - 5) Recycled content.
 - 4. MR Credit 4, Building Product Disclosure and Optimization - Material Ingredients.
 - 5. With each Application for Payment, submit progress reports using the Building Product Disclosure and Optimization (BPDO) Calculator spreadsheet software available from USGBC for the following:
 - a. MR Credit 2: BPDO - EPD
 - b. MR Credit 3: BPDO - Sourcing of Raw Materials
 - c. MR Credit 4: BPDO - Material Ingredients
 - 6. EQ Credit 2, Low Emitting Materials.
 - a. Low Emitting Materials Tracking Sheet monitoring the project's progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings.
 - 7. EQ Credit 3, Indoor Air Quality, During Construction, complying with Division 01 Section "Indoor Air Quality Management."
 - 8. EQ Credit 4, Indoor Air Quality Assessment, complying with Division 01 Section "Indoor Air Quality Management."

1.7 SUBMITTALS

- A. Sustainable Design Documentation: The scope of required documentation is specified in this section and in applicable individual specification sections.
 - 1. Submit each LEED submittal simultaneously with applicable product submittal.
 - 2. Material Content Form: Project submittals must be accompanied by a completed Material Content Form (Included at the end of this section). Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Material Content Form.
 - a. Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
- B. LEED v4 Prerequisites and Credits - Documentation is required for the following items:
 - 1. SS Prerequisite 1: Construction Activity Pollution Prevention
 - a. Provide periodic inspection reports or date-stamped photographs demonstrating the erosion and sedimentation control plan measures in compliance with the 2012 US Environmental Protection Agency (EPA) Construction General Permit (CGA) or local equivalent.
 - 1) Include maintenance activities during construction.
 - 2. MR Credit 2: BPDO - EPD - **Alternate Compliance with LEED v4.1.**
 - a. Option 1 - EPD: Provide industry-wide EPDs or product-specific EPDs demonstrating ISO 14025 compliance and stating EPD Program Operator.
 - 1) Provide documentation of confirming Product Category Rules (PCR) standard EN 15804 or ISO 21930.
 - 2) For industry-wide EPD: Include documentation that the manufacturer is recognized participant.
 - 3) Include EPD Summary.
 - 3. MR Credit 3: BPDO - Sourcing of Raw Materials - **Alternate Compliance with LEED v4.1.**
 - a. Option 2 - Responsible Sourcing of Raw Materials : Documentation demonstrating compliance with one of the following extraction criteria. Include each material cost value.
 - 1) Extended Producer Responsibility (EPR) Program, one of the following:
 - (a) Manufacturer-based programs: Brochure or letter from manufacturer describing the EPR program, contact information, proof that product is included in the program.
 - (b) Third-party program: Brochure describing recycling process and average rate of return for the material.
 - 2) Bio-based products: Product data or manufacturer letter on company letterhead stating compliance with ASTM Test Method D6866.
 - (a) If available, provide manufacturer letter on company letterhead stating raw material supplier's compliance with Sustainable Agriculture Network's (SAN) Sustainable Agriculture Standard, including a link to a publicly available document confirming SAN compliance.
 - (b) Include a statement indicating percentage by weight of the total assembly that is bio-based.
 - 3) Certified Wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC number.
 - 4) Reused Materials: Invoices indicating source and end-use for reused materials.
 - 5) Recycled Content: Documentation indicating percentages by weight of total assembly pre-consumer and post-consumer recycled content.

- 6) For products that meet one of the above and are regionally sourced material: Documentation indicating location of extraction, manufacture, purchase of primary raw materials.
4. MR Credit 4: BPDO - Material Ingredients - **Alternate Compliance with LEED v4.1.**
 - a. Option 1 - Material Ingredients Reports: Documentation demonstrating compliance with one of the following:
 - 1) Manufacturer Inventory
 - 2) Health Product Declaration (HPD)
 - 3) Cradle to Cradle (C2C) v3 Bronze level
 - 4) Cradle to Cradle Material Health Certificate: Bronze level or higher
 - 5) Declare Product Label - LBC Red List Free
 - 6) Declare Product Label - Declared
 - 7) Declare Product Label - LBC Compliant: Content inventory to 1000 parts per million (0.1%).
 - 8) UL's Product Lens Certification
5. MR Credit 5: Construction and Demolition Waste Management
 - a. Waste Management Progress Reports: Refer to Division 01 Section "Construction Waste Management and Disposal."
 - b. Option 1 - Path 2, Divert 75% and Four Material Streams.
 - c. Option 2, Reduction of Total Construction and Demolition Waste Material.
6. EQ Credit 2: Low-Emitting Materials - **Alternate Compliance with LEED v4.1.**
 - a. Refer to Division 01 "Volatile Organic Compound (VOC) Content Restrictions".
 - b. General Emissions Evaluation: Provide certificate stating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 including TVOC range for the following building materials:
 - 1) Paints and coatings wet-applied within the building interior.
 - (a) Include volume of material applied per product in liters (L).
 - 2) Wall Panels (gypsum board, plaster, wall covering, wall paneling, cubicle curtain, partition wall, doors, window treatments) installed within the building interior.
 - (a) Include material cost or total surface area per product in square feet (SF).
 - 3) Flooring installed within the building interior.
 - 4) Ceilings, walls (gypsum board and wallcovering), thermal and acoustic insulation installed within the building interior.
 - c. Composite Wood Evaluation: For composite wood permanently installed within the building interior, provide manufacturer product data indicating one of the following:
 - 1) Certification of compliance with California Air Resources Board (CARB), Airborne Toxic Control Measures (ATCM), Phase II, for ultra-low-emitting formaldehyde (ULEF) resins.
 - 2) No added formaldehyde (NAF) resin.
 - 3) For products claiming CARB exemption: Executive Order letter stating manufacturer, product name and the exemption.
 - d. Volatile Organic Compound (VOC) Content: Provide manufacturer product data indicating VOC content as measured in grams per Liter (g/L).
 - 1) For wet-applied paints and coatings applied on the exterior and within the building interior.
7. EQ Credit 3: Construction IAQ Management
 - a. Refer to Division 01 "Indoor Air Quality Management".
 - b. Provide manufacturer product data indicating MERV rating of temporary and final filtration media.
 - 1) Include dates and locations of all filter replacement installations.
 - c. Provide 18 photographs, at least three different periods of time during construction to demonstrate the implementation of SMACNA measures, annotated with date measure in place, and general location of the photograph.

- 1) Alternatively, provide a narrative demonstrating how the IAQ Plan was implemented and describing the protection of materials from moisture damage.

1.8 CLOSEOUT SUBMITTALS

- A. LEED Online: At completion of construction and prior to contract closeout, contractor shall complete the LEED Online Form and upload the associated required documentation to the LEED Online Project Database for the following.
 1. SS Prerequisite 1: Construction Activity Pollution Prevention
 2. MR Prerequisite 2 and Credit 5: Construction and Demolition Waste Management
 3. MR Credit 2: BPDO - Environmental Product Declarations
 4. MR Credit 3: BPDO - Sourcing of Raw Materials
 5. MR Credit 4: BPDO - Material Ingredients
 6. EQ Credit 2: Low-Emitting Materials
 7. EQ Credit 3: Construction IAQ Management Plan
 8. EQ Credit 4: IAQ Assessment
- B. Contractor shall respond to questions and requests from USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the Project's LEED certification application.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROCEDURES

- A. Submit sustainable design documentation required of Contractor, using procedures defined under Submittals for Information in Section 01 3000.
- B. Where an item of sustainable design documentation is specified, fill out and submit electronically the appropriate form(s), and/or use appropriate software.
 1. Fill out one line for each different brand name product and each different manufacturer of a lot of commodity products.
 2. Where required attachments are specified, attach the documentation.
 3. Mark each blank with the appropriate information; use "ATT" for items attached; if any item is not relevant use the code "NR"; if any item is not available use the code "NA".
- C. Each form must be signed by the entity capable of certifying the information.
 1. Certification signatures must be made by an officer of the company.
 2. For products, certification must be made by the manufacturer not the supplier.
 3. For custom fabricated products, certification by the fabricator is acceptable.

END OF SECTION



LEED v4 / v4.1 for BD+C: Schools Project Checklist

Y ? N

1	Credit	Integrative Process	v 4.1	1
9 4 2 Location and Transportation				
15	Credit	LTc1 - LEED for Neighborhood Development Location		15
1	Credit	LTc2 - Sensitive Land Protection	v 4.1	1
2	Credit	LTc3 - High Priority Site		2
3	Credit	LTc4 - Surrounding Density and Diverse Uses		5
4	Credit	LTc5 - Access to Quality Transit		4
1	Credit	LTc6 - Bicycle Facilities		1
1	Credit	LTc7 - Reduced Parking Footprint		1
1	Credit	LTc8 - Green Vehicles		1

3 3 6 Sustainable Sites				
Y	Prereq	SSp1 - Construction Activity Pollution Prevention		Required
Y	Prereq	SSp2 - Environmental Site Assessment		Required
1	Credit	SSc1 - Site Assessment		1
2	Credit	SSc2 - Site Development – Protect or Restore Habitat		2
1	Credit	SSc3 - Open Space	v 4.1	1
3	Credit	SSc4 - Rainwater Management		3
2	Credit	SSc5 - Heat Island Reduction		2
1	Credit	SSc6 - Light Pollution Reduction		1
1	Credit	SSc7 - Site Master Plan		1
1	Credit	SSc8 - Joint Use of Facilities		1

6 4 2 Water Efficiency				
Y	Prereq	WEp1 - Outdoor Water Use Reduction		Required
Y	Prereq	WEp2 - Indoor Water Use Reduction		Required
Y	Prereq	WEp3 - Building-Level Water Metering		Required
2	Credit	WEC1 - Outdoor Water Use Reduction		2
3	Credit	WEC2 - Indoor Water Use Reduction		7
2	Credit	WEC3 - Cooling Tower Water Use	v4.1	2
1	Credit	WEc4 - Water Metering		1

14 6 11 Energy and Atmosphere				
Y	Prereq	EAp1 - Fundamental Commissioning & Verification		Required
Y	Prereq	EAp2 - Minimum Energy Performance		Required
Y	Prereq	EAp3 - Building-Level Energy Metering		Required
Y	Prereq	EAp4 - Fundamental Refrigerant Management		Required
5	Credit	EAc1 - Enhanced Commissioning	1	6
8	Credit	EAc2 - Optimize Energy Performance	4	16
1	Credit	EAc3 - Advanced Energy Metering	1	1
2	Credit	EAc4 - Demand Response	2	2
3	Credit	EAc5 - Renewable Energy Production	3	3
1	Credit	EAc6 - Enhanced Refrigerant Management	1	1
2	Credit	EAc7 - Green Power and Carbon Offsets	2	2

Project Name: FCPS - Waverley Elementary School
Date: March 16, 2020

5	1	7	Materials and Resources		13
Y	Prereq	MRp1 - Storage & Collection of Recyclables			Required
Y	Prereq	MRp2 - Construction & Demolition Waste Management Planning			Required
1	Credit	MRc1 - Building Life-Cycle Impact Reduction		v 4.1	5
1	Credit	MRc2 - Building Product Disclosure & Optimization – Environmental Product Declarations		v 4.1	2
1	Credit	MRc3 - Building Product Disclosure & Optimization – Sourcing of Raw Materials		v 4.1	2
1	Credit	MRc4 - Building Product Disclosure & Optimization – Material Ingredients		v 4.1	2
2	Credit	MRc5 - Construction & Demolition Waste Management			2

8	3	5	Indoor Environmental Quality		16
Y	Prereq	EQp1 - Minimum Indoor Air Quality Performance			Required
Y	Prereq	EQp2 - Environmental Tobacco Smoke Control		v 4.1	Required
Y	Prereq	EQp3 - Minimum Acoustic Performance			Required
2	Credit	EQc1 - Enhanced Indoor Air Quality Summary of Requirements			2
2	Credit	EQc2 - Low-Emitting Materials		v 4.1	3
1	Credit	EQc3 - Construction Indoor Air Quality Management Plan			1
2	Credit	EQc4 - Indoor Air Quality Assessment			2
1	Credit	EQc5 - Thermal Comfort			1
2	Credit	EQc6 - Interior Lighting			2
3	Credit	EQc7 - Daylight			3
1	Credit	EQc8 - Quality Views			1
1	Credit	EQc9 - Acoustic Performance			1

3	3	0	Innovation		6
1	Credit	IN1.1 - Design for Active Occupants			1
1	Credit	IN 1.2 - Occupant Comfort Survey			1
1	Credit	IN 1.3 - Purchasing - Lamps			1
1	Credit	IN1.4 - Community Outreach and Involvement			1
1	Credit	IN1.5 - Bird Collision Deterrence			1
1	Credit	LEED Accredited Professional			1

3	0	1	Regional Priority		4
1	Credit	Regional Priority: Sensitive Land Protection			1
1	Credit	Regional Priority: Reduced Parking Footprint			1
1	Credit	Regional Priority: Enhanced Commissioning			1
1	Credit	Regional Priority: Rainwater Management			1

52 24 34 TOTALS Possible Points: 110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

SECTION 01 3329.01 - MATERIAL CONTENT FORM

PROJECT NAME: WAVERLEY ELEMENTARY SCHOOL REPLACEMENT; NO.: 18045.

- 1.1 APPLICABLE SPECIFICATION SECTION NUMBER(S) _____
- 1.2 PRODUCT NAME: _____
(BRAND NAME, MODEL NUMBER, ETC.)
- 1.3 MANUFACTURER NAME: _____ WWW. _____
- 1.4 SOURCE LOCATION: _____ (IF PROCESSED AT
MULTIPLE LOCATIONS, ATTACH A DESCRIPTION; SEE SECTION 01 6000)
- 1.5 SOURCE LOCATION: _____
(IF PROCESSED AT MULTIPLE LOCATIONS, ATTACH A DESCRIPTION)

PRODUCT CONTENT

- 2.1 TOTAL WEIGHT: _____ POUNDS PER _____ (UNIT).
- 2.2 MR CREDIT 2: ENVIRONMENTAL PRODUCT DECLARATION (EPD).
- A. Industry-Wide EPD or Product-Specific EPD (Type III):
- _____ Is Attached
- _____ Is Not Available.
- 2.3 MR CREDIT 3: SOURCING OF RAW MATERIALS
- A. _____ % Solid wood, wood chip, and fiber content, by weight.
- _____ Product is FSC-trademarked.
- _____ FSC Chain-of-Custody certificate number is _____
- _____ SFI Certified _____ ATFS Certified _____ SFM Certified.
- B. _____ % Other bio-based content, by weight; sourced from a SAN-Certified farm.
- C. _____ % Steel content, by weight.
- _____ Steel Mill Source is: _____
- _____ Mill letter describing mill process and typical re-used steel content is attached.
- D. _____ % Pre-Consumer (Post-Industrial) recycled content, by weight, other than steel.
- E. _____ % Post-Consumer recycled content, by weight, other than steel.

2.4 EQ CREDIT 2: LOW EMITTING MATERIALS

- A. _____ Zero Intentionally added methylene chloride or perchloroethylene. (Paints,Coatings, Adhesives and Sealants).

2.5 INNOVATION: PBT SOURCE REDUCTION

- A. _____ Zero intentionally added cadmium (interior or exterior paints and coatings).
- B. _____ Zero lead content (paints and coatings).

EMISSIONS AND HEALTH

3.1 MR CREDIT 4: MATERIAL INGREDIENTS.

- A. Compliance with one of the following: Health Product Declaration (HPD), Manufacturer Inventory, Cradle to Cradle (C2C) v2 Basic level or v3 Bronze level, Cradle to Cradle Material Health Certificate: Bronze level or higher, Declare Product Database, UL's Product Lens Certification, ACT's Facts Certification.

_____ Is Attached

_____ Is Not Available.

3.2 EQ CREDIT 2: COMPOSITE WOOD EVALUATION:

- A. _____ Complying with CARB composite wood regulation for ULEF or no added formaldehyde resin.

3.3 EQ CREDIT 2: GENERAL EMISSIONS EVALUATION:

- A. _____ Low-emitting material meeting requirements of CAL (CDPH SM), Private Office Scenario

3.4 EQ CREDIT 2: WET-APPLIED PRODUCTS:

- A. _____ VOC content meeting SCAQMD Rule 1113.
- B. _____ VOC Content: Meeting CARB 2007, SCM for Architectural Coatings.
- C. _____ VOC content meets SCAQMD Rule 1168.
- D. _____ Other VOC content test report; See Section 01 3329 - Sustainable Design Reporting.

CERTIFIED BY: (MANUFACTURER)

4.1 _____ DOCUMENTATION OF ALL CLAIMS MADE ABOVE IS ATTACHED.

COST CERTIFICATION: (CONTRACTOR)

5.1 TOTAL INSTALLED MATERIAL COST OF THIS PRODUCT: \$ _____

5.2 NO. OF UNITS INSTALLED: _____

5.3 TOTAL VOLUME INSTALLED: _____(WET-APPLIED PRODUCTS)

5.4 CERTIFIED BY: (CONTRACTOR)

PRINT NAME: _____

SIGNATURE: _____

TITLE: _____ (OFFICER OF COMPANY)

END OF SECTION

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

1.2 RELATED REQUIREMENTS

- A. Section 01 4216 - Definitions.

1.3 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.
- H. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.4 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
 - 1. Include required product data and shop drawings.
 - 2. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

- D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect for information.
 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.8 REFERENCES AND STANDARDS

- A. Obtain copies of standards where required by product specification sections.
- B. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.9 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing noted in individual specification sections.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of any other standards listed in individual specification sections, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740, ASTM E329, and any other standards listed in individual specification sections.
 - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 4. Laboratory: Authorized to operate in the State in which the Project is located.
 - 5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.
- C. Room Mock-ups: Construct room mock-ups of classroom pairs indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Architect to evaluate quality of the mock-up(s) in stages; to include at a minimum:
 - 1. Rough-in of electrical, mechanical, plumbing, telecommunication, etc. infrastructure.
 - 2. Completion of flooring.
 - 3. Installation of built-in casework.
- D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- H. Accepted mock-ups shall be a comparison standard for the remaining Work.
- I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.
- J. Where possible salvage and recycle the demolished mock-up materials.

3.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

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

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

3.6 DEFECT ASSESSMENT

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

END OF SECTION



ECS Mid-Atlantic, LLC
14026 Thunderbolt Place, Suite 100
Chantilly, Virginia 20151
Tel: 471-8400 Fax: (703) 834-5527

Fluid Applied Waterproofing Checklist

Project Name and Number: _____ Weather & Temp.: _____

Day & Date: _____ Contractor: _____

Substrates:

Type: ☐ Gypsum ☐ CMU ☐ Concrete ☐ Wood

Substrate clean? Yes ___ No ___

Substrate joints sealed / treated? Yes ___ No ___

Sealant/Treatment Type:

Substrate joints taped? Yes ___ No ___

Joint Tape:

Substrate attached as specified? Yes ___ No ___

Primer:

Primer manufacturer: _____

Primer type: _____

Required for Membrane? Yes ___ No ___

Stored/applied above 40° F? Yes ___ No ___

Low temperature primer? Yes ___ No ___

Application temperature: _____ °

Even distribution on substrate? Yes ___ No ___

Primer dry? Yes ___ No ___

Application method: _____

Membrane Flashing:

Type of membrane: _____

Strips installed per Manufacturer? Yes ___ No ___

Application temperature: _____ °

Wrinkles and Void? Yes ___ No ___

Penetration Sealed? Yes ___ No ___

Proper Lap Width? Yes ___ No ___

Proper Width: _____

Waterproofing Application:

Type: _____

Roller Application? Yes ___ No ___

Roller Type: _____

Spray Application? Yes ___ No ___

Spray Pump Model: _____

Evenly Distributed on Substrate? Yes ___ No ___

Wet Thickness Check? Yes ___ No ___

Wet Thickness: _____

Dry Thickness Check? Yes ___ No ___

Dry Thickness: _____

Protected from UV? Yes ___ No ___

Days of applied material? _____

☐ No Deficiencies Observed

☐ A Re-observation Showed Deficiency was Corrected

☐ Deficiency Observed, Re-observation Required

☐ Contractor Corrected Deficiency During Visit



ECS Mid-Atlantic, LLC
14026 Thunderbolt Place, Suite 100
Chantilly, Virginia 20151
Tel: 471-8400 Fax: (703) 834-5527

Air/Vapor Barrier Checklist

Project Name and Number: _____ Weather & Temp.: _____

Day & Date: _____ Contractor: _____

Substrates:

Type: ☐ Gypsum ☐ CMU ☐ Concrete ☐ Wood

Substrate clean? Yes ___ No ___

Substrate joints sealed / treated? Yes ___ No ___

Sealant/Treatment Type:

Substrate joints taped? Yes ___ No ___

Joint Tape:

Substrate attached as specified? Yes ___ No ___

Primer:

Primer manufacturer: _____

Primer type: _____

Required for Membrane? Yes ___ No ___

Stored/applied above 40° F? Yes ___ No ___

Low temperature primer? Yes ___ No ___

Application temperature: _____ °

Even distribution on substrate? Yes ___ No ___

Primer dry? Yes ___ No ___

Application method: _____

Membrane Flashing:

Type of membrane: _____

Strips installed per Manufacturer? Yes ___ No ___

Air/Vapor Permeable Tape Installed? Yes ___ No ___

Sealant at Terminal Edges? Yes ___ No ___

Rolled with approved rollers? Yes ___ No ___

Application temperature: _____ °

Wrinkles and Void? Yes ___ No ___

Penetration Sealed? Yes ___ No ___

Proper Lap Width? Yes ___ No ___

Proper Width: _____

Air/Vapor Barrier Application: Air ___ Vapor ___

Type: _____

Roller Application? Yes ___ No ___

Roller Type: _____

Spray Application? Yes ___ No ___

Spray Pump Model: _____

Evenly Distributed on Substrate? Yes ___ No ___

Wet Thickness Check? Yes ___ No ___

Wet Thickness: _____

Dry Thickness Check? Yes ___ No ___

Dry Thickness: _____

Protected from UV? Yes ___ No ___

Days of applied material? _____

Building Wrap / Wall Ties: NA ___

Building paper type: _____

Attachment method: _____

Approved attachment method? Yes ___ No ___

Seams taped/ sealed? Yes ___ No ___

Penetrations taped/ sealed? Yes ___ No ___

Watershedding pattern? Yes ___ No ___

Brick Ties Installed? Yes ___ No ___

Brick Ties Patches? Yes ___ No ___

Visible damage? Yes ___ No ___

☐ No Deficiencies Observed

☐ A Re-observation Showed Deficiency was Corrected

☐ Deficiency Observed, Re-observation Required

☐ Contractor Corrected Deficiency During Visit



ECS Mid-Atlantic, LLC
14026 Thunderbolt Place, Suite 100
Chantilly, Virginia 20151
Tel: 471-8400 Fax: (703) 834-5527

Project Name: _____ Project Number: _____

Contractor: _____ Client: _____ Weather/Temp.: _____

Day/Date: _____ Arrive Project: _____ Depart Project: _____

ROOF INSULATION:

1st Layer: _____ "

2nd Layer: _____ "

Tapered: _____ "/ft

Mech. Fast: _____

Adhesive: _____

FM Required? I- _____ No _____ Yes _____

Staggered Joints: _____ Yes _____ No _____

Joints on Flutes _____ Yes _____ No _____

MEMBRANE:

Lap Adhesive _____ No _____ Yes _____

Lap Tape _____ No _____ Yes _____

Heat Welded _____ No _____ Yes _____

Membrane Type: _____ "

Lap Width: _____ "

T-Patches _____ No _____ Yes _____

Voids _____ No _____ Yes _____

Wrinkles, Ridges _____ No _____ Yes _____

Fishmouths _____ No _____ Yes _____

Ballasted _____ No _____ Yes _____

Mechanically Fastened _____ No _____ Yes _____

Fully Adhered _____ No _____ Yes _____

BASE FLASHING

Perim. Fast. Type: _____

Perim. Fast. @ _____ " o.c.

Adhered to Substrate _____ Yes _____ No _____

Top Edge Nailed _____ " _____ Yes _____ No _____

Counterflashed/Sealed _____ Yes _____ No _____

Bridging _____ No _____ Yes _____

Open Laps/Seams _____ No _____ Yes _____

8"-14" Above Roof _____ Yes _____ No _____

METAL FLASHING

Metal Sandwiched _____ Yes _____ No _____

Corners Rounded _____ Yes _____ No _____

Fastened _____ " o.c. _____ Yes _____ No _____

Fastened Thru Insulation _____ No _____ Yes _____

OTHER

Physical Damage _____ No _____ Yes _____

Night Tie-Ins _____ Yes _____ No _____

Proper Storage of Material _____ Yes _____ No _____

☐ No Deficiencies Observed ☐ Deficiency Observed, Reinspection Required
☐ A Reinspection Showed Deficiency was Corrected ☐ Contractor Corrected Deficiency During Visit

Contractor Representative: _____ Technician: _____

Title/Company: _____ Print Name: _____

SECTION 01 4216 - DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

- A. **Furnish:** To supply, deliver, unload, and inspect for damage.
- B. **Install:** To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. **Product:** Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. **Project Manual:** The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. **Provide:** To furnish and install.
- F. **Supply:** Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4219 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

1.2 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with the reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.1 AA -- ALUMINUM ASSOCIATION, INC.

2.2 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- E. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- F. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
 - H. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- 2.3 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS
- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.
- 2.4 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
- A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
 - B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
 - C. AISC 360 - Specification for Structural Steel Buildings.
- 2.5 AISI -- AMERICAN IRON AND STEEL INSTITUTE
- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.
- 2.6 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.
- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
 - B. AMCA 511 - Certified Ratings Program for Air Control Devices.
- 2.7 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE
- A. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification.
 - B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
 - C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
 - D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.
 - E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
 - F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.

- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.
- L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- M. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
- N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
- O. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- P. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.
- Q. ANSI A135.4 - American National Standard for Basic Hardboard.
- R. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- S. ANSI A208.1 - American National Standard for Particleboard.
- T. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
- U. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- V. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- W. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- X. ANSI/ESD STM7.1 - Standard Test Method for the Protection of Electrostatic Discharge Susceptible Items - Floor Materials - Resistive Characterization of Materials.
- Y. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- Z. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems.

2.8 ASCE -- AMERICAN SOCIETY OF CIVIL ENGINEERS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

2.9 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.

2.10 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

- A. ASME A17.1 - Safety Code for Elevators and Escalators.
- B. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks.

2.11 ASTM A SERIES -- ASTM INTERNATIONAL

- A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- B. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- F. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- G. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- K. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- L. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- M. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.

- N. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- O. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

2.12 ASTM B SERIES -- ASTM INTERNATIONAL

- A. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- B. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- E. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
- F. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
- G. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

2.13 ASTM C SERIES -- ASTM INTERNATIONAL

- A. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- B. ASTM C91/C91M - Standard Specification for Masonry Cement.
- C. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- D. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- E. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
- F. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- H. ASTM C150/C150M - Standard Specification for Portland Cement.
- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- J. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.

- K. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale).
- L. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- N. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- O. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- P. ASTM C476 - Standard Specification for Grout for Masonry.
- Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- R. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- S. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- T. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- U. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- V. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- W. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- X. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- Y. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- Z. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- AA. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- AB. ASTM C834 - Standard Specification for Latex Sealants.
- AC. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- AD. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- AE. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- AF. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

- AG. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- AH. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- AI. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- AJ. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
- AK. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- AL. ASTM C1036 - Standard Specification for Flat Glass.
- AM. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- AN. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- AO. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- AP. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- AQ. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- AR. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- AS. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- AT. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- AU. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- AV. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- AW. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- AX. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- AY. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- AZ. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

2.14 ASTM D SERIES -- ASTM INTERNATIONAL

- A. ASTM D523 - Standard Test Method for Specular Gloss.

- B. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.
- C. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.
- D. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
- E. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.
- F. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- G. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- H. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- J. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- K. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- L. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- M. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.
- N. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- O. ASTM D5149 - Standard Test Method for Ozone in the Atmosphere: Continuous Measurement by Ethylene Chemiluminescence.
- P. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- Q. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- R. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

2.15 ASTM E SERIES -- ASTM INTERNATIONAL

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

- C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- E. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- G. ASTM E413 - Classification for Rating Sound Insulation.
- H. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- I. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.
- J. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.
- K. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- L. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- M. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- O. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- P. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- Q. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- R. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

2.16 ASTM F SERIES -- ASTM INTERNATIONAL

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- C. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
- D. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

- E. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- F. ASTM F1861 - Standard Specification for Resilient Wall Base.
- G. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

2.17 AWI -- ARCHITECTURAL WOODWORK INSTITUTE

- A. AWI (QCP) - Quality Certification Program.

2.18 AWI/AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK INSTITUTE/ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

2.19 AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE

- A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.

2.20 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION

- A. AWPA U1 - Use Category System: User Specification for Treated Wood.

2.21 AWS -- AMERICAN WELDING SOCIETY

- A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- C. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

2.22 BHMA -- BUILDERS HARDWARE MANUFACTURERS ASSOCIATION

- A. BHMA A156.9 - American National Standard for Cabinet Hardware.
- B. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.

2.23 BIA -- BRICK INDUSTRY ASSOCIATION

- A. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- B. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- C. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- D. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

2.24 CAL -- STATE OF CALIFORNIA

2.25 CARB -- CALIFORNIA AIR RESOURCES BOARD

- A. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board.
- B. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

2.26 CDA -- COPPER DEVELOPMENT ASSOCIATION, INC.

- A. CDA A4050 - Copper in Architecture - Handbook.

2.27 CRI -- CARPET AND RUG INSTITUTE

- A. CRI 104 - Standard for Installation of Commercial Carpet.

2.28 EC -- EUROPEAN COMMISSION

- A. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

2.29 FM -- FACTORY MUTUAL GLOBAL

- A. FM (AG) - FM Approval Guide.
- B. FM 4991 - Approval Standard for Firestop Contractors.
- C. FM DS 1-28 - Wind Design.

2.30 GA -- GYPSUM ASSOCIATION

- A. GA-216 - Application and Finishing of Gypsum Panel Products.
- B. GA-600 - Fire Resistance Design Manual.

2.31 GANA -- GLASS ASSOCIATION OF NORTH AMERICA

- A. GANA (GM) - GANA Glazing Manual.
- B. GANA (SM) - GANA Sealant Manual.
- C. GANA (LGRM) - Laminated Glazing Reference Manual.

2.32 GREENSEAL -- GREEN SEAL, INC.

- A. GreenSeal GS-36 - Adhesives for Commercial Use.

2.33 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION

- A. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

2.34 IAS -- INTERNATIONAL ACCREDITATION SERVICE

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories.
- B. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.

2.35 ICC -- INTERNATIONAL CODE COUNCIL, INC.

- A. ICC (IBC) - International Building Code.

2.36 ICC-ES -- ICC EVALUATION SERVICE, INC.

- A. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.
- B. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.

2.37 ICRI -- INTERNATIONAL CONCRETE REPAIR INSTITUTE

- A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

2.38 IGMA -- INSULATING GLASS MANUFACTURERS ALLIANCE

- A. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

2.39 ISFA - INTERNATIONAL SURFACE FABRICATORS ASSOCIATION

- A. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

2.40 ISO -- INTERNATIONAL STANDARDS ORGANIZATION

- A. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures.
- B. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework.
- C. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines.
- D. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services.

2.41 ITS -- INTERTEK TESTING SERVICES NA, INC.

2.42 MPI -- MASTER PAINTERS INSTITUTE (MASTER PAINTERS AND DECORATORS ASSOCIATION)

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

2.43 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

- A. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.
- B. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- C. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- D. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- E. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

2.44 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- C. NEMA LD 3 - High-Pressure Decorative Laminates.
- D. NEMA MG 1 - Motors and Generators.

2.45 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

- A. NFPA 10 - Standard for Portable Fire Extinguishers.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- C. NFPA 70 - National Electrical Code.
- D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- E. NFPA 101 - Life Safety Code.
- F. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- G. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- H. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- I. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- J. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

2.46 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION

- A. NRCA (RM) - The NRCA Roofing Manual.
- B. NRCA (WM) - The NRCA Waterproofing Manual.

- 2.47 NTMA -- NATIONAL TERRAZZO AND MOSAIC ASSOCIATION, INC., THE
 - A. NTMA (GRAD) - Aggregate Gradation Standards.
 - B. NTMA (EPOXY) - Epoxy Terrazzo Specifications.
- 2.48 SCAQMD -- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
 - A. SCAQMD 1113 - Architectural Coatings.
 - B. SCAQMD 1168 - Adhesive and Sealant Applications.
- 2.49 SDI -- STEEL DOOR INSTITUTE
 - A. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- 2.50 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.
 - A. SMACNA (ASMM) - Architectural Sheet Metal Manual.
 - B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.
- 2.51 SPIB -- SOUTHERN PINE INSPECTION BUREAU, INC.
 - A. SPIB (GR) - Grading Rules.
- 2.52 SSPC -- SOCIETY FOR PROTECTIVE COATINGS
 - A. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
 - B. SSPC-SP 1 - Solvent Cleaning.
 - C. SSPC-SP 2 - Hand Tool Cleaning.
 - D. SSPC-SP 7 - Brush-Off Blast Cleaning.
 - E. SSPC-SP 13 - Surface Preparation of Concrete.
- 2.53 TCNA -- TILE COUNCIL OF NORTH AMERICA, INC.
 - A. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.
- 2.54 TMS -- THE MASONRY SOCIETY
 - A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.
- 2.55 UL -- UNDERWRITERS LABORATORIES INC.
 - A. UL (DIR) - Online Certifications Directory.
 - B. UL (FRD) - Fire Resistance Directory.
 - C. UL 10B - Standard for Fire Tests of Door Assemblies.

- D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
- F. UL 879 - Electric Sign Components.
- G. UL 972 - Standard for Burglary Resisting Glazing Material.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- I. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

2.56 USGBC -- U. S. GREEN BUILDING COUNCIL

- A. USGBC LEED v4-BD+C - LEED v4 for Building Design and Construction.

2.57 WCMA -- WINDOW COVERING MANUFACTURERS ASSOCIATION

- A. WCMA A100.1 - Safety of Window Covering Products.

2.58 WDMA -- WINDOW AND DOOR MANUFACTURERS ASSOCIATION (FORMERLY NWWDA)

- A. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.1 CFR -- CODE OF FEDERAL REGULATIONS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content.
- C. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- D. 29 CFR 1910.28 - Duty to have Fall Protection and Falling Object Protection.
- E. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices.
- F. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

3.2 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION

- A. CPSC Pub. No. 325 - Public Playground Safety Handbook.

3.3 PS -- PRODUCT STANDARDS

- A. PS 1 - Structural Plywood.
- B. PS 20 - American Softwood Lumber Standard.

3.4 IAC/PSCP -- STATE OF MARYLAND INTERAGENCY COMMITTEE/PUBLIC SCHOOL
CONSTRUCTION PROGRAM

A. Administrative Procedures Guide; revised February 2017.

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dewatering
- B. Temporary utilities.
- C. Temporary telecommunications services.
- D. Temporary sanitary facilities.
- E. Temporary Controls: Barriers, enclosures, and fencing.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Field offices.

1.2 DEWATERING

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

1.3 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical power, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.
- B. Existing facilities may not be used.
- C. New permanent facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.4 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.6 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.7 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.8 EXTERIOR ENCLOSURES

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

1.9 SECURITY

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

1.10 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site weekly.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01548

USE, HANDLING, STORAGE, TRANSPORTING, ACCUMULATION, AND DISPOSAL OF CONTROLLED MATERIAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. General provisions of the Contract, including bonding, insurance, and other specification sections, apply to this section.
- B. The report “Demolition Hazardous Materials Survey, Waverley Elementary School, Frederick, Maryland” prepared by AERO EH&S, Inc. and dated January 18, 2019 provides a summary of hazardous materials to be removed.

1.02 SUMMARY

- A. This section covers the demolition, use, handling, storage, transporting, accumulation, and disposal of hazardous or recyclable materials/substances/chemicals that may be encountered or that may be used by the Contractor during the course of the work. The Contractor is made aware by this specification that hazardous or recyclable materials/substances/chemicals are regulated by a multitude of statutes and regulations and require special care.
- B. All hazardous and recyclable materials and wastes generated or removed during this construction contract at the site will be disposed of by the Contractor.
- C. Related Sections: This specification section is related to any and all specification sections with explicit or implicit reference to project management and coordination. Specific submittal requirements of these related specification sections are not included in this section. Related sections include, but are not limited to, the following specification sections:
 - 1. Specification Section 02085 Asbestos Abatement
 - 2. Specification Section 02086 Mercury-Containing Tube and Lamp Removal
 - 3. Specification Section 02087 PCB Light Ballast Removal
 - 4. Specification Section 02090 Lead-Based Paint Removal and Disposal
 - 5. Specification Section 02091 Lead-Containing Paint Removal

1.03 REFERENCES

- A. In addition to these specifications, the following publications designate and define hazardous materials and conditions, and establish procedures for handling these materials and conditions. Omission of any publication in this section does not remove any obligation or legal requirement on the part of the Contractor to comply with all legal requirements for the location of the work.

1. Code of Federal Regulations (CFR):

- a. 29 CFR Part 1910: Occupational Safety and Health Administration (OSHA) General Industry and Health Standards.
- b. 29 CFR Part 1910.134: Respiratory Protection
- c. 29 CFR Part 1910.145: Specifications for Accident Prevention Signs and Tags
- d. 29 CFR Part 1910.20 Sub-part C: General Safety and Health Provisions
- e. 29 CFR Part 1926: Safety and Health Regulations for Construction
- f. 29 CFR Part 1926.62: Lead
- g. 29 CFR Part 1926.65: Hazardous Waste Operations and Emergency Response
- h. 29 CFR 1926 Subpart Z: Toxic and Hazardous Substances
- i. 40 CFR Part 61: National Emissions Standards for Hazardous Air Pollutants
- j. 40 CFR Parts 9 and 82: Protection of Stratospheric Zone (CFCs), Clear Air Act Amendments of 1990
- k. 40 CFR Parts 122 and 125: National Pollutant Discharge Elimination System Clean Water Act
- l. 40 CFR Parts 260 - 272: Solid and Hazardous Wastes, Resource Conservation and Recovery Act
- m. 40 CFR Part 165: Disposal and Storage of Pesticides and Pesticide Containers
- n. 40 CFR Subchapter J Parts 300 - 373: Superfund Emergency Planning, and Community Right-to-Know Programs
- o. 40 CFR Parts 700 - 799: Toxic Substances Control Act (TSCA)
- p. 49 CFR Parts 171 - 179: Department of Transportation (DOT)
- q. Federal Standard 313A: Material Safety Data Sheets, Preparation and Submission of

2. American National Standards Institute (ANSI)
 - a. Z288.2: Standard for Respiratory Protection
3. American Society for Testing and Materials (ASTM)
 - a. E849-82: Safety and Health Requirements Relating to Occupational Exposure to Asbestos
4. State and Local Regulations: The Contractor shall comply with all current :
 - a. State of Maryland, Frederick County, and City of Frederick Regulations.
 - b. Title 26, Code of Maryland Regulation (COMAR)

1.04 DEFINITIONS

- A. "Controlled Material" is defined as any material that poses a threat to human health or to the environment; that can be recycled or reused; for which disposal in municipal landfills is regulated or restricted; for which unregulated introduction into groundwater, land, or the atmosphere is irresponsible; and that should be designated as "hazardous waste."
1. It is imperative that the use, handling, storage, transporting, and disposal of hazardous and recyclable materials and solid waste in these facilities and on the property be disciplined and consistent, both to ensure the safety of Contractor personnel and visitors and to avoid incurring liabilities or penalties as a consequence of reckless or improper disposal or recycling of waste generated in, deposited on, brought to, or transported from the project site.
 2. A number of statutes and regulations define the term "hazardous" in a variety of ways depending on the nature, condition, and intended use or disposal of the particular material, substance, and/or chemical. To simplify the manner in which these materials are addressed, the term "hazardous material" is used to identify all materials, substances, and chemicals that exhibit the properties defined by this specification:
 - a. Any material, substance, and chemical that because of its quantity, concentration, or physical, chemical or infectious characteristics is toxic, lethal, corrosive, flammable or combustible, reactive, an irritant, a strong sensitizer, or generates pressure by decomposition, heat, or other means and is injurious to human beings, animal life, and/or the environment shall be considered "hazardous."
 - b. Exhaustive but not inclusive lists of these hazardous materials are detailed in the following regulations: RCRA 40 CFR 261; CERCLA

40 CFR 302; SARA 40 CFR 355, 370 & 372; FIFRA 40 CFR 152;
TSCA 40 CFR 700-799; COMAR Title 26.13.02.15.19.

- B. A "recyclable material" is defined as any material that must be recycled or reused under Federal, state, or local regulations, or can be recycled and reused in an economically feasible manner.
- C. A "Mercury Item" is an object that contains mercury as a result of the manufacturing process. Examples of mercury items: manometers, thermometers, pumps, switches, relays, thermostats, and fluorescent tubes. Mercury spills, materials contaminated from spills, and other materials that have not been manufactured to a specific shape for purposes of this section are not mercury items.

1.05 CONTROLLED MATERIAL STANDARDS AND CONTRACTUAL RESPONSIBILITIES

- A. Hazardous materials defined by Paragraph 1.04 may not be dumped into storm drains, sewage lines, or dumpsters, nor are they to be introduced into the environment in an uncontrolled manner.
- B. Regulatory Compliance: The Contractor shall comply with all Federal, state, and local regulations and the conditions of the facility operating permits and licenses applicable to activities and services performed under the contract. A partial but not an inclusive list of such laws and regulations are identified in Paragraph 1.03 of this specification.
- C. All contractors will be informed of hazardous materials and potential hazards present in the areas in which the Contractor's employees will be working.
- D. Upon request by the Owner or Owner's Representative, the Contractor shall provide documentation that personnel are properly trained in generating, handling, and storing hazardous wastes.
- E. The Contractor shall dispose of hazardous materials belonging to him or which are generated as a result of this contract at no additional expense to the Owner. Waste shall be disposed of on a daily basis unless waste is placed in an approved temporary storage location.
- F. Contractor Liability and Responsibility
 - 1. The Contractor shall assume full responsibility and liability for compliance with all applicable regulations affecting the health and safety of Contractor personnel and others during work operations.

2. Quantities of materials to be removed, which are provided with this specification and attached documents, are approximate estimates by the Project Designer. It shall be the responsibility of the Contractor to verify understanding and agreement with quantities provided prior to submitting a bid. If the Contractor bids for this work without disputing specified quantities of described materials, this shall indicate acceptance of a Scope of Work, which includes removal of all described materials, regardless of listed quantity. In the event quantities are not provided, the Contractor is responsible for removal of all described materials.
 3. In the performance of the contract, the Contractor shall provide for the protection of the health and safety of others present on site.
 4. The Contractor shall assume full liability and responsibility for all hazardous materials brought to the contract site. The use, handling, storage, transporting, and disposal of such materials shall comply with all regulatory conditions, the manufacturer's recommendations, and the Material Safety Data Sheet (MSDS) for that substance. Copies of MSDSs will be maintained on site. Quantities of materials stored and used at the work site shall be limited to the minimum amount required to accomplish the prescribed task or activity.
 5. The Contractor will be responsible for site storage, shipment, and disposal of hazardous wastes and substances. The Contractor will be responsible for proper shipment and disposal at Contractor-proposed, Owner-approved disposal facilities.
- G. Provisions for and Conditions of Temporary Storage of Hazardous Materials on Owner Property: Hazardous waste for which the Contractor is responsible for transportation and disposal may be accumulated at the site for up to 30 days, except for extremely hazardous waste materials, provided that:
1. The containers holding the hazardous waste are in good condition, are labeled with all contents, and are not leaking.
 2. The containers are made of or lined with materials that will not react with and are otherwise compatible with the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.
 3. The containers are closed during storage, except when it is necessary to add or remove waste, and the containers are not opened, handled, or stored in a manner which may rupture the container or cause it to leak.
 4. The containers are inspected at least weekly to check for leaks and for deterioration caused by corrosion or other factors.

5. The containers are securely stored away from high traffic areas in a locked area to prevent deliberate or accidental release of hazardous materials.
6. The location selected for storage of the waste containers provides secondary containment of accidental discharge from the containers.
7. The containers are stored on the job site at a location pre-approved by the Owner or Owner's Representative.
8. If a container is leaking, the waste must be immediately transferred to a sound container by the Contractor and treated as a hazardous material spill.

H. Disposal Method

1. The Contractor shall maximize the use of treatment facilities that employ valid, best available technologies to permanently destroy or render the hazardous material non-hazardous.
 2. Land disposal of hazardous waste shall be minimized. Landfills shall only be employed by the Contractor when no other satisfactory method of treatment for a particular waste is available.
 3. Recycling and reuse of materials are encouraged to the extent economically feasible.
- I. Hazardous Material Spill: Hazardous material spills on site shall be reported immediately to the local Fire Department (dial 911). The Contractor shall take immediate measures to contain the spill, prevent its spread, and ensure proper cleanup. If there is a threat to health or safety, or danger of further contamination, the Owner may elect to take charge of the cleanup, perform the required cleanup, and charge the Contractor for expenses incurred. Hazardous material spill response is explained in Paragraph 1.08.
- J. Hazardous Materials Log: The Contractor shall maintain a hazardous materials log on the job site that identifies the type and amounts of materials generated on the site, type and amounts of materials brought to the site, and the type and amounts of materials transported from the site. Documentation shall be in chronological order to identify the sequence of activities.
- K. The Contractor shall maintain a Material Safety Data Sheet (MSDS) binder on the construction site that shall include all hazardous materials used on the construction site.
- L. Alternative Materials: Alternative products and materials that are less hazardous and will produce comparable results must be used.

1.06 DELEGATION OF AUTHORITY FOR OWNER APPROVAL

- A. For work related to Controlled Material, including use, handling, storage, transporting, accumulation, and disposal, the Owner has designated AERO EH&S, Inc., hereinafter referred to as the Owner's Representative, to act in his behalf in hazardous waste issues only.

1.07 SUBMITTALS

- A. Hazardous Materials Waste Management Plan: Any hazardous materials (i.e., solvents, floor mastic strippers, adhesives, etc.) brought onto the job site by the Contractor or generated as a result of project work shall require the Contractor to prepare a Hazardous Materials Waste Management Plan. This plan shall be prepared and submitted to the Owner's Representative for review. No work shall begin until the plan has been approved by the Owner's Representative. The Hazardous Materials Waste Management Plan shall:
 - 1. Include a list of all hazardous materials to be used on the job site, including how the materials will be used, handled, stored, packaged, manifested, transported, and disposed.
 - 2. Ensure that use of any chemical agents, such as floor mastic strippers, sealants, adhesives, or other agents containing strong solvents, is approved by the Owner.
 - 3. Include MSDSs for all hazardous materials to be used or generated as a result of the project.
 - 4. Delineate the process, procedures, and methods to be used by the Contractor to contain or evacuate fumes, vapors, dusts, aerosols, etc. that may be released or generated so as to protect personnel when hazardous materials are used or generated.
 - 5. Delineate the safety procedures, personnel protection measures, and precautions to be taken covering all operations involving hazardous materials, including handling, use, loading, transporting, and first aid.
 - 6. Include a hazardous materials spill control plan for materials in transit.
 - 7. Include the identification of the State/EPA permit number and Certification of Insurance of any proposed transporter.
 - 8. Include the identification, description, location, and the State/EPA permit number of any proposed disposal site(s).
 - 9. Include a list of all contract employees assigned to the project along with their titles, duties, education, training, and experience.

10. Include a scheme for minimization of the waste volume to the maximum extent possible either through recycling, alternate methods or processes, or conservation of waste materials.

B. Hazardous Waste Manifests

1. The Contractor is responsible for all Hazardous Waste Manifest documentation to include properly filling out the required documentation, maintaining the records, tracking the manifest, and distribution. The Hazardous Waste Manifest will be approved and signed by the Owner.
2. The Contractor shall provide the Hazardous Waste Manifest(s) and any other required regulatory shipment documents to the Owner's Representative for review and approval at least one day preceding a planned shipment of hazardous materials or waste. When the manifest is approved and signed by the Owner's Representative, the Contractor shall leave a copy with the Owner's Representative and ensure that appropriate copies accompany the shipment.
3. While the Contractor may arrange off-site transportation activities at his convenience, the Owner will be available for signing manifests only during normal business hours.
4. The receiving or disposal facility official shall sign the manifest certifying receipt of the shipment and forward a copy from that facility to the Owner's Representative within seven (7) days after receipt.

C. Approval of Transporter

1. All transporters the Contractor proposes to use must be approved by the Owner's Representative in writing prior to the generation, storage, or removal of hazardous waste materials on the job site. The Contractor shall furnish the Owner's Representative with a compliance summary of the proposed transporter which minimally contains the following:
 - a. Current copies of the transporter's operating permits and licenses.
 - b. Copies of environmental impairment insurance.
2. Should there be a need for an alternate transporter in the case of an accident or release in transit, the alternate transporter must be approved by the Owner's Representative.
3. If remedial action is required to contain and clean up a spill, the Contractor shall work under the direction of the local regulatory authorities responding to the incident. The Contractor shall utilize the most efficient resources available to expedite the control and clean up.

If such an event should occur in transit, the Contractor shall immediately notify the Owner's Representative.

D. Approval of Treatment, Storage, and Disposal Facilities (TSDF)

1. All transfer facilities or treatment, storage, and disposal facilities the Contractor proposes to use must be approved in writing by the Owner's Representative prior to removal, generation, or storage of hazardous materials on the job site.
2. The Owner reserves the right to prohibit the Contractor from employing the services of a subcontractor that does not possess the ability to satisfactorily perform in conformance with the provisions of the contract. The use of a subcontractor(s) does not relieve the Contractor of any requirements or responsibilities set forth in the contract. The Contractor is responsible for ensuring that any subcontractor(s) perform in accordance with the terms and conditions of the contract.
3. If, during the period of the contract, the Contractor requests the approval of additional TSDFs, the Owner must be allowed reasonable time to evaluate such requests.

E. PCB Plan of Action: Provide a PCB Plan of Action in the Hazardous Materials Waste Management Plan for approval by the Owner's Representative addressing all requirements set forth in Paragraph 3.03.D of this section, including the location of EPA approved recycling and incineration sites, qualifications of transporter, methods of transport, and a description of the methods to be employed to prevent release to the environment. The Contractor shall explain the method for documenting proper PCB disposal (incineration) to the Owner and include the written procedures in the Hazardous Materials Waste Management Plan.

F. Certification of Final Disposition

1. It is the Contractor's responsibility to obtain all necessary documentation to prove the final treatment/disposal of all wastes has been accomplished. This documentation shall be included in the Certificate of Final Disposition and submitted with or prior to the invoice for payment. A Certificate of Final Disposition shall itemize each container received at the treatment/disposal facility, shall document the date and method of treatment or disposal, and shall be forwarded to the Owner's Representative within four (4) months of the date the material was received at the disposal facility.
2. If the material is disposed of in a secured chemical landfill facility, then the Certificate of Final Disposition shall also indicate the location within the landfill where the waste container was buried through the use of cell numbers, coordinates, or other appropriate identifiers.

1.08 EMERGENCY RESPONSE AND REMEDIATION OF SPILLS AND RELEASES

- A. Notify Owner: The Contractor shall be responsible, in the event of a spill of hazardous material resulting from the execution of this contract, for immediately notifying the Owner's Representative. The following information will be supplied to the Owner's Representative in writing as part of the notification process:
 - 1. Type of material.
 - 2. Quantity of material spilled.
 - 3. Date and time spill occurred.
 - 4. Environmental media released (i.e., air, water, soil, etc.)
 - 5. Location, type, and extent of spill.
 - 6. Cause of spill.
 - 7. Methods used or proposed to control or clean up the spill.
- B. Spill Kits: The Contractor is responsible for providing spill kits at the work site for all hazardous materials brought into the work site by the Contractor.
- C. Reporting of Spills, Leaks, and Releases: The Contractor is not authorized to issue press releases concerning incidents at the project site or to report releases on or from the project site to regulatory authorities. Such news releases and reporting shall be performed only as directed by the Owner.

1.09 PERSONNEL QUALIFICATIONS AND REQUIREMENTS

- A. The Contractor must ensure that every person is trained pursuant to the directions in 49 CFR 172.202 and HM-126F if they are responsible for any of the following:
 - 1. Prepares hazardous materials for use, storage, or disposal.
 - 2. Handles, loads, unloads, or moves hazardous materials.
 - 3. Fills out forms for the transportation of hazardous materials.
 - 4. Is in any way responsible or accountable for any hazardous materials in Owner facilities.
- B. Qualified personnel are essential and shall be provided by the Contractor for the performance of this contract to ensure that public health, safety, and protection of the environment are ensured during the use, handling,

packaging, transporting, treatment, and/or disposal of hazardous materials and that property of the Owner is protected.

- C. Contractor personnel must possess all personal licenses, permits, and certifications required to perform their duties. For example, truck drivers hauling hazardous wastes in Maryland must hold current CHS Driver Certifications.

1.10 ENVIRONMENTAL SAFETY OFFICER

- A. The Contractor shall retain the full-time services of a Safety Officer possessing previous experience in hazardous materials work. The Safety Officer shall interpret the published rules and regulations governing hazardous materials and will provide direction in the implementation of said regulations and safety requirements. This work shall include but not be limited to:
 - 1. Monitoring the Contractor's work with hazardous material for compliance with published rules and regulations by EPA, OSHA, and the State of Maryland including use, handling, storage, packaging, transporting, and disposal.
 - 2. Providing the Owner's Representative with all required documentation pertaining to hazardous materials use, handling, removal, clean up, transport, and disposal.

PART 2 – PRODUCTS

EQUIPMENT

- A. Equipment, including disposable protective clothing, used in the execution of this contract and/or provided to visitors to the site shall comply with applicable Federal, State, and local regulations.

TOOLS

- A. Tools used in the execution of this contract and/or provided to visitors to the site shall comply with applicable Federal, State, and local regulations. Tools shall be used in strict compliance with manufacturers' written instructions for their intended use.

MATERIALS

- A. Materials used in the execution of this contract and/or provided to visitors to the site shall comply with applicable Federal, State, and local regulations. Materials shall be used in strict compliance with manufacturers' written instructions for their intended use.
- B. Product Material Safety Data Sheets (MSDS): MSDSs will be submitted as part of the Contractor's Hazardous Materials Waste Management Plan and maintained on site along with all product data from the manufacturer for all applicable substances to be used.
- C. Container Requirements: All transportation containers purchased and used by the Contractor shall meet DOT Title 49 CFR requirements and regulations for shipment of hazardous materials. Only new containers, free from damage which could compromise the integrity of the container, shall be used. Any damaged containers shall be rejected and replaced by the Contractor at no cost to the Owner. The Contractor shall provide all documents and container labels as required.
- D. All Product Data and corresponding manufacturers' information, shop drawings, and manuals must be submitted and approved prior to initiation of work. All product data must be maintained on site at all times during work.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Isolate the Hazardous Material area for the duration of the work to prevent unauthorized access by designating the area off limits to all but authorized personnel. Maintain a log of all persons visiting the Hazardous Material work site.
- B. Post warning signs and labels as required by this contract, 29 CFR 1910, 40 CFR 761, and as directed by the Owner's Representative.

3.02 WORK PROCEDURES

- A. General Procedures: Perform all Hazardous Materials related work in strict compliance with the general safety and health provisions of the referenced requirements. If a conflict arises in the regulations, the more stringent application/requirements for overall safety shall apply until a determination is made otherwise by the Owner's Representative.
- B. Coordination of Work of all Trades: Coordinate the work of all trades to ensure their work is performed in accordance with the applicable regulations and the hazardous materials control area remains separated from the remaining work areas.
- C. All contractors will be informed of hazardous materials and potential hazards present in the areas in which the Contractor's employees will be working.

3.03 REQUIREMENTS FOR CONTROLLED MATERIALS

- A. Lead
 - 1. ITEMS USUALLY CONTAINING LEAD: paint, soft solder, radiation shielding, pipe, cup sinks, terne roofing.
 - 2. OPERATIONS INVOLVED: chipping, sanding, grinding, soldering, welding, flame torch cutting, abrasive blasting, and spray painting.
 - 3. DEMOLITION PROCEDURES: Demolition procedures shall meet OSHA Guidelines "Working with Lead in the Construction Industry," OSHA Publication 3126, latest edition. This standard lists hazard-reducing techniques for lead demolition such as using vacuum dust collection systems to capture lead dust and fumes at the point of

generation. Paint removal shall not employ an open flame, or dry sanding or grinding. Also, the use and selection of respiratory protection and other protective equipment shall be as specified.

4. RECYCLING: Large quantities of lead such as lead sheeting, lead sinks, and lead blocks must be recycled.
5. DISPOSAL: Disposal of lead shall be in accordance with Paragraph 1.05.

B. Lead Paint

1. SPECIAL PERMITS REQUIRED: The State of Maryland requires that lead-based paint abatement and lead-based paint removal be done only by those with an MDE license. Verification of a current license will be submitted to the Owner's Representative.
2. Lead-based paint and lead-containing paint are present throughout the building.
3. Owner-conducted TCLP testing of composite samples of construction debris, excluding other hazardous materials and metallic lead objects, resulted in analytical results less than 5 ppm lead (see attached AERO EH&S, Inc. report).
4. Removal of lead-based paint shall conform to Specification Section 02090.
5. Removal of lead-containing paint shall conform to Specification Section 02091.

C. Mercury Items

1. REMOVAL: Segregate all mercury items and protect sealed mercury sources from damage. Mercury light removal shall also conform to Specification Section 02086.
2. STORAGE: Mercury items shall be stored in appropriate containers that are clearly labeled to identify the contents. Appropriate containers are those that will not deteriorate or react with mercury or allow mercury to leak into the environment during normal use handling, and disposal procedures. Regulations for containing and labeling mercury items can be found in 49 CR 172.101.
3. DISPOSAL: Disposal of mercury shall be in accordance with Paragraph 1.05.

D. Batteries: Batteries are not to be discarded in waste.

1. USES OF BATTERIES: Emergency lightning, uninterruptible power supplies (UPS), emergency power generation.

2. DISPOSAL: All batteries, regardless of size or material, are to be properly disposed of or recycled by the Contractor in accordance with Paragraph 1.05.
- E. Items with Liquid Dielectric Suspected of Containing PCBs (Polychlorinated Biphenyls)
1. TYPES OF ITEMS: Fluorescent light fixture ballasts, oil circuit breakers, capacitors, liquid transformers, electrical ballasts. Items manufactured after 1978 should carry a "NO PCBs" label. Items not clearly labeled, or without labels, or having unknown dielectric shall be considered to contain PCBs under this specification and shall be treated, handled, and disposed of as hazardous PCB waste.
 2. REMOVAL: The following is a basic outline of the minimum steps that shall be taken during the removal of PCB-containing ballasts from buildings. The plan of action shall be submitted by the Contractor for approval by the Owner, shall include the procedures he intends to follow, and shall address these points:
 - a. A minimum of two layers of 6-mil plastic shall be placed on the floor beneath the disposal drums, the actual work area, and beneath stored disposal drums.
 - b. Pour a minimum three (3) inch layer of oil absorbent in a DOT 17-H drum labeled as containing PCB.
 - c. Remove the light ballast from the light fixture. Wires exiting from the ballast shall be cut to less than three (3) inches long. Place the ballast in the drum. If the ballast is clearly labeled as "Non-PCB" or "No PCB", then the ballast can remain with the fixture and the fixture can be removed and disposed as construction debris.
 - d. If an unmarked ballast shows any sign of leaking, PCB-resistant gloves shall be worn when handling the fixture. If the PCB status cannot be clearly determined from the label, the ballast shall be removed from the fixture and treated as hazardous waste.
 - e. Dispose of any light fixture which held an unlabeled leaking ballast as PCB-contaminated material.
 - f. Alternately layer the ballasts and 2-inch layers of absorbent until the drum is full, carefully checking to ensure that the last layer in the drum will be absorbent.
 - g. Place all used disposable protective clothing and plastic in the drum.
 - h. Label the drum with a DOT-OREM label with the following minimum information:

- i. Date materials were placed in the drum.
 - ii. Materials in the drum (ex.: 75 two-tube light ballasts).
 - iii. Name, address, and phone number of the manufacturer of the generator or owner of the light ballasts.
 - iv. Container identification number (ex.: DC0093ZZ-001BAL)
 - v. The weight of each container is to be recorded (in kilograms) and entered on the manifest.
 - i. Make arrangements, i.e., obtain EPA Generator Identification Number, make EPA notifications, fill out hazardous waste manifest, and incinerate or recycle the material in the drum(s) as PCB-contaminated solid waste.
 - j. Transport the drum(s) and any other PCB materials to an EPA approved incinerator or ballast recycling facility.
 - k. The Contractor may transport the drum(s) and other PCB materials to an EPA approved ballast recycling facility which dismantles the ballast, segregates, and packages the PCB components of a ballast for incineration, and then reclaims non-contaminated materials remaining after recycling.
3. STORAGE: Short term storage shall be in accordance with Paragraph 1.05 herein.
 4. DISPOSAL: Immediately arrange for disposal of these items. Collect and dispose of all other PCB-contaminated waste, rags, scrap, debris, bags, containers, equipment, and PCB-contaminated clothing in properly labeled PCB disposal drums. Waste PCB-containing material shall be transported to an incineration site or ballast recycling facility. Incinerate all PCB-contaminated materials remaining after recycling. The Contractor shall provide the Owner's Representative with a copy of all manifests and continuation sheets resulting from the incineration of the PCB-containing waste. In some instances, a temporary holding area can be established upon approval by the Owner's Representative for properly packaged PCB waste.

F. Oils - Confirmed Non-PCB-Containing

1. ITEMS CONTAINING OILS: Internal combustion engines, bearings, refrigeration and heating units, all industrial machinery. Waste oil may also be in oily rags used for maintenance and possibly in soil contaminated by leaks or spills.
2. RECYCLING: The Contractor shall make every effort to recycle the waste oil. If there is an economically feasible method to recycle the waste oil, the Contractor shall do so.

3. STORAGE: The Contractor shall not mix waste oils with general waste. Waste oils shall be stored in appropriate containers that are clearly labeled to identify contents. Appropriate containers are those that will not deteriorate or react with the oil or allow the oil to leak into the environment during normal use, handling, and disposal procedures. Regulations for containing and labeling petroleum oil waste can be found in 49 CFR 172.101.
 4. DISPOSAL: All material is to be properly disposed of or recycled by the Contractor in accordance with Paragraph 1.05 herein.
- G. Solvents. The Contractor shall use non-toxic and non-flammable solvents whenever these alternative solvents are feasible.
1. KINDS OF SOLVENTS: Paint solvents, gasoline, and other toxic and ignitable solvents.
 2. STORAGE: The Contractor shall not mix solvents with general waste. Solvents shall be stored in NFPA-approved flammable liquid containers that are clearly labeled to identify contents. Appropriate containers are those that will not deteriorate or react with the solvents or allow the solvents to leak into the environment during normal use, handling, and disposal procedures. Regulations for containing and labeling solvents can be found in 49 CFR 172.101.
 3. DISPOSAL: All materials are to be properly disposed of by the Contractor in accordance with Paragraph 1.05.
- H. Chlorofluorocarbons (CFCs)
1. USES OF CHLOROFLUOROCARBONS: Refrigerants, propellants in some aerosol cans.
 2. FEDERAL REGULATIONS FOR CFCs: As of July 1, 1992, the Clean Air Act makes it unlawful to vent CFCs to the atmosphere. During the repair, servicing, or replacement of items such as cold rooms and chillers, CFCs shall be captured before they would otherwise be released to the atmosphere. When refrigerant systems are to be purged of air, venting of CFCs must be kept to a minimum.
 3. STORAGE: The Contractor shall store used refrigerant in containers meeting DOT regulations for refill services. Drums and other storage containers shall be checked for leaks prior to use. When known, these containers must be labeled with the specific CFC they contain.
 4. DISPOSAL OF AEROSOL CANS:
 - a. Aerosol cans that are empty in accordance with 40 CFR 261.7 provisions may be disposed of as conventional waste.

- b. Aerosol cans that are not empty in accordance with 40 CFR 261.7 shall be considered hazardous material and shall be disposed of in conformance with hazardous material regulations.
- c. Aerosol cans having an unknown propellant shall be considered to contain CFCs under this specification and shall be treated as such.
- d. Disposal shall be in accordance with Paragraph 1.05
- e. CFC CAPTURE: CFCs will be captured for reuse or recycling.

I. Gas Cylinders

- 1. KINDS OF GAS CYLINDERS: All compressed gases.
- 2. INSPECTION: Gas cylinders shall be visually checked for damage and shall be handled and moved in a manner that will not damage the valves or rupture the cylinders.
- 3. DISPOSAL: Gas cylinders shall be returned to the gas vendor either for refilling or proper disposal depending on the condition of the cylinder. In no case shall the Contractor discard these cylinders in waste dumpsters.

J. Scrap Metal and Containers (contaminated)

- 1. KINDS OF HAZARDOUS SCRAP METAL: Metal as well as plastic drums and containers that once held Owner-regulated waste (including solvents, oils, paint, etc.).
- 2. STORAGE: Spent metal or plastic drums and containers over 5-gallon capacity shall not be included with general waste. These items shall be stored and disposed of separately. The containers shall be clearly labeled to identify they are empty but also the label shall clearly identify the original contents to facilitate disposal. Other hazardous scrap metal shall be stored in containers that will not react with the material or allow the hazardous material to disperse into the environment.
- 3. DISPOSAL: All materials are to be properly disposed of by the Contractor in accordance with Paragraph 1.05.

K. Scrap Metal (non-contaminated)

- 1. SOURCES OF NON-HAZARDOUS SCRAP METAL: Casework, metal wall partitions, sheet metal, nuts, bolts, and other metal construction waste.
- 2. RECYCLING: Every attempt shall be made to recycle these materials by the Contractor.

3. DISPOSAL: If material cannot be recycled, non-hazardous scrap metal shall be disposed of as construction debris in accordance with the contract.
- L. Asbestos: See Specification Section 02085 for proper removal, packaging and disposal of asbestos.
- M. Paint: The Contractor shall use non-toxic and non-flammable paints whenever these alternative paints are feasible. Use of lead-containing paint is prohibited. For removal or disposal of lead-containing paint, see Paragraph 3.03.A.
1. KINDS OF PAINTS: Toxic and/or flammable oil based paint.
 2. STORAGE: The Contractor shall not mix hazardous paints with general waste. Toxic and/or flammable paints shall be stored in NFPA-approved flammable liquid containers/cabinets that are clearly labeled to identify contents. Appropriate containers are those that will not deteriorate or react with the paints or allow the paints to leak into the environment during normal use, handling, and disposal procedures. Regulations for containing and labeling paints/solvents can be found in 49 CFR 172.101. All paint containers shall be sealed securely to prevent spilling or dispersal during transport.
 3. DISPOSAL: All materials are to be properly disposed of by the Contractor in accordance with Paragraph 1.05.
- N. Scrap Equipment
1. RECYCLING: Every attempt shall be made to recycle these materials by the Contractor.
 2. DISPOSAL: If material cannot be recycled, scrap equipment shall be disposed of as construction debris in accordance with the contract.
- 3.04 PACKAGING, LABELING, AND MARKING OF HAZARDOUS WASTE MATERIALS FOR SHIPMENT OFF SITE
- A. General Shipping Requirements: Contractor shipments of hazardous and mixed wastes or materials shall be performed in accordance with the latest revision of all applicable EPA Title 40 CFR, NRC Title 10 CFR, and DOT Title 49 CFR requirements. As new packaging, labeling, and shipping regulations are promulgated and approved, the Contractor shall take the necessary measures to comply. The Contractor shall provide all documents and labels required for shipping wastes and materials.

3.05 SHIPPING TO TREATMENT, STORAGE, AND DISPOSAL FACILITIES AND OTHER OFF-SITE DESTINATIONS.

- A. Use of Hazardous Waste Manifest: Uniform Hazardous Waste Manifests (EPA Form 8700-22 or latest revision thereof) shall be properly completed by the Contractor for each waste shipment and shall list each transportation container including any non-hazardous waste or hazardous materials shipped. The Contractor shall use the manifest of the receiving state unless that state does not have one, in which case the Contractor shall use the generator state manifest. All manifest information shall be neatly typed and contain all information required by applicable Federal, state, and local hazardous waste or materials regulations. The Contractor shall provide all data required for waste transportation, treatment, or disposal, and for completion of hazardous waste or material generator report as required by the regulatory agency of jurisdiction.
- B. DOT Emergency Response Information Requirements: The Contractor and the transporter must comply with the DOT Emergency Response Communication Standards applicable to the shipment of hazardous materials.
- C. Use of Permitted Hazardous Waste Facilities with Full RCRA Permit Status.
 - 1. Storage, treatment, or disposal of hazardous wastes and materials shall be carried out only at facilities that have been issued final operating permits pursuant to RCRA and implemented by the hazardous waste regulatory authority(ies) of jurisdiction. Facilities that have applied for formal permits and are in interim status may be used by the Contractor only upon written certification by the Contractor that no fully permitted facilities are available and upon written approval of the interim status facility by the Owner's Representative. All Facility Permits must explicitly state that they are permitted for each particular waste and material that is to be treated, stored, or disposed of under this contract.
 - 2. All facilities used for interim treatment or final treatment and disposal of items under this contract shall have as a minimum an EPA and state approved interim status permit showing EPA hazardous waste numbers for each waste the facility is permitted to handle, as described in 40 CFR 261, Subparts C and D. Mere acceptance of the waste or material at a properly permitted TSDF does not meet the definition of final treatment and disposal under this contract.

3.06 FIELD QUALITY CONTROL

- A. Site Inspection and Stop Work Orders: While performing this work, the Contractor shall be subject to on-site inspection by the Owner/Owner's representative. Work shall also be subject to inspection by OSHA and EPA inspectors and/or local building or health officials. If found to be in violation by any of these officials, the Contractor shall cease all work immediately. Until the violation is resolved, standby time required to resolve the violation shall be at the Contractor's expense.

3.07 CLEANUP AND DISPOSAL

- A. Permits and Notifications: Secure necessary permits in conjunction with hazardous material removal, hauling, and disposition and provide timely notification of such actions, as may be required by Federal, state, regional, and local authorities. Notify the Regional Office of the United States Environmental Protection Agency and provide copies of the notification to the Owner's Representative 10 calendar days prior to the commencement of the work.
- B. Housekeeping: Essential elements of hazardous materials control include housekeeping and clean up procedures. Maintain all surfaces within the work area free of accumulations of debris to prevent further dispersion and contamination. Give meticulous attention to restricting the spread of debris, keep waste from being distributed over the general area or to other areas in the building. The blowing down of the work area with compressed air is forbidden. Post appropriate hazard warning signs. In all possible instances, workmen shall clean up their own areas. Equip personnel engaged in cleaning up scrap and waste with appropriate personal protective clothing.
- C. Approval of Final Clean Up: The Owner's Representative will inspect the work area in concert with the Contractor for approval of hazardous material clean up. Visible signs of potential contamination, dust, or debris are not permitted on any surface in or around the work area. The Owner's Representative will approve final cleaning and restoration of the work area.

END OF SECTION 01548

SECTION 01 5721 - INDOOR AIR QUALITY MANAGEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction to comply with LEED v4 EQ Credit 3: Construction IAQ Management Plan.
- B. Testing indoor air quality after completion of construction to comply with LEED v4 EQ Credit 4: Indoor Air Quality Assessment.

1.2 PROJECT GOALS

- A. See Section 01 3329 - Sustainable Design Reporting LEED v4/v4.1 for Schools, for overall project goals relating to environment and energy.
- B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.3 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ASTM D5149 - Standard Test Method for Ozone in the Atmosphere: Continuous Measurement by Ethylene Chemiluminescence.
- C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- D. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.

1.4 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.

- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.5 SUBMITTALS

- A. Sustainable Design Documentation: Submit all submittals required in this section in accordance with procedures specified in Section 01 3329.
- B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedures.
- C. Air Contaminant Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Locations and scheduling of air sampling.
 - 3. Test procedures, in detail.
 - 4. Test instruments and apparatus.
 - 5. Sampling methods.
- D. Air Contaminant Test Reports: Show:
 - 1. Location where each sample was taken, and time.
 - 2. Test values for each air sample; average the values of each set of 3.
 - 3. HVAC operating conditions.
 - 4. Certification of test equipment calibration.
 - 5. Other conditions or discrepancies that might have influenced results.

1.6 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Air Filtration Media
 - 1. Temporary filtration media: Filtration media rated for minimum efficiency reporting value (MERV) of 8 minimum, when tested in accordance with ASHRAE 52.2-2007.
 - a. Alternative Compliance Path: Provide Class F5 or higher filtration media, in accordance with CEN Standard EN 779-2002.

2. Permanent filtration media for each ventilation system that supplies outdoor air to occupied spaces: Filtration media rated for minimum efficiency reporting value (MERV) of 13 minimum when tested in accordance with ASHRAE 52.2-2007.
 - a. Alternative Compliance Path: Provide Class F7 or higher filtration media, in accordance with CEN Standard EN 779-2002.

PART 3 EXECUTION

3.1 GENERAL

- A. Incorporate procedures and processes during Construction and prior to occupancy as described herein.
- B. Provide and enforce Construction Indoor Air Quality Plan for all construction activities within the building.

3.2 HVAC PROTECTION

- A. If permanent HVAC is used during construction: Use filtration media at each return air grill. All HVAC systems, equipment and pathways to be dust and particulate free at time of substantial completion of that phase of construction, in accordance with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."
 1. Begin construction ventilation after building is substantially enclosed.
 2. Prevent movement of air from construction area to occupied area when working in a portion of an occupied building.
- B. Keep HVAC system clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling, installation and punch-out. Inspect all air inlets, air outlets, grilles, diffusers, plenums, and ducts upon completion of work.
 1. Cover and protect (taped plastic or similar method) all exposed air inlet and outlet openings, grilles, ducts, plenums, to prevent water, moisture, dust and other contaminate intrusion.
 2. Apply protection immediately after installation of equipment and ducting.
 3. Protect at end of each Work day duct runs that require more than a single day to install.
 4. Check and repair leaks in return ducts and air handlers.
 5. Do not use mechanical rooms for construction storage.
 6. Inspect filtration monthly and replace as needed with new MERV 8 filtration media throughout the HVAC system.
 7. Install new filtration media throughout the HVAC system after final phase of construction.
 8. Cleaning of ductwork is not part of this contract; if Contractor fails to protect ducts and equipment from construction pollutants as specified, provide ductwork cleaning at Contractor's cost.
- C. Install all ceiling tiles prior to HVAC use if an unducted plenum must be used over a construction zone.

3.3 SOURCE CONTROL

- A. Prohibit smoking (including use of electronic cigarettes) within the building and within 25 feet (2.5 meters) of building entrances, operable windows, or outdoor-air intakes.

- B. Limit use of fossil-fueled temporary heating units to propane-powered only inside the building and near building entrances, windows and intakes and within 25 feet of building entrances, operable windows, or outdoor-air intakes.
- C. Provide direct exhaust to the exterior during use of fossil-fueled temporary heating units and installation of strong emitting materials, including touch-up activities.
 - 1. Keep exhaust away from intakes and occupied spaces.
- D. Protect “absorptive” or dry sink materials from exposure to dust, debris and moisture contamination during product delivery, storage and handling from construction, demolition and punch-out activities.
- E. Provide adequate ventilation of packaged dry products prior to installation.
- F. Prohibit “bake-out” or “super-heating” of spaces to accelerate the release of gaseous emissions.

3.4 PATHWAY INTERRUPTION

- A. Relocate pollutant sources when project equipment or staging areas coincide with critical air flow pathways.
- B. Place plastic barriers to contain construction areas.
- C. Temporarily seal building, including air intakes and exhaust vents, and any other building openings, when dust-generating or strong-emitting construction products or procedures are used on the exterior of the building.
- D. Once spaces within building become occupied, work areas must remain under negative pressure. Exhaust air at a rate at least 10 percent greater than the rate of supply.
 - 1. Do not exhaust air where it can be drawn back into occupied spaces.
 - 2. Place continuous plastic barriers creating a seal between construction areas and occupied spaces.

3.5 HOUSEKEEPING

- A. Clean floors regularly to keep dust from accumulating during construction and demolition.
- B. Remove debris from building on a daily basis and suppress dust during construction and demolition activities with wetting agents or sweeping compounds.
- C. Prior to use of return air ductwork without intake filters, clean up and remove dust and debris generated by construction activities.
- D. Use HEPA-filter vacuum throughout for final detailed cleaning.
- E. Remove spills or excess application of solvent-containing products when discovered.
- F. Keep work areas as dry as possible. Replace any absorptive (dry sink) material that is exposed to moisture.

3.6 SCHEDULING

- A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.

- B. Schedule for storage, installation, and protection of all components of air distribution systems.
- C. Schedule for storage, installation, and protection of absorptive materials (woven, fibrous or porous, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short-term release of off-gassing volatile organic compounds.
 - 1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as dust, debris, moisture, gaseous and microbial contamination.
 - 2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.
- D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.

3.7 INDOOR AIR QUALITY ASSESSMENT

- A. Confirm the completion of the following prior to IAQ testing.
 - 1. Complete final cleaning the building including ductwork.
 - 2. Install all interior finishes and movable furnishing with all major punch list items completed.
 - 3. Install new air filtration media.
 - 4. Complete test, adjust and balance HVAC systems for proper operation.
- B. Conduct baseline IAQ testing, prior to occupancy, but during normal occupied hours, and with building ventilation system started at the normal start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the testing.
 - 1. Use testing protocols consistent with LEED v4 Interior Design and Construction EQ Credit: IAQ Assessment, current versions of ASTM standard (D5197, D5149-02), US EPA "Compendium of Methods for the Determination of Air Pollutants in Indoor Air" (EPA TO-1, YO-11, TO-17; EPA IP-3, IP-6, IP-10) or ISO methods (ISO 16000-3, 7708, 13964, 16000-6, and ISO 4224).
 - 2. Provide the services of a laboratory accredited under ISO/IEC 17025 for the test methods used. Determine sampling time based on testing method and maximum allowable concentration.
 - 3. Support the IAQ testing services firm by coordinating scheduling of required testing, and providing services during IAQ remediation if necessary.
 - 4. Conduct IAQ testing after testing and balancing of the HVAC system has been completed.
 - 5. For each sampling point where maximum concentration limits are exceeded take corrective action and retest the specific parameter(s) that were exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. Take samples from the same locations as the first test when re-testing non-complying building areas.
 - 6. Test at least one location per ventilation system, minimum one test per floor. Testing locations must represent worst-case zones.
 - 7. Maximum testing area for offices: 5000 square feet.
 - a. Where spaces are identical in construction, finishes, configuration, square footage and HVAC system, test one of seven identical spaces. If sampled space fails, test all seven spaces.
 - 8. Collect air samples between 3 feet and 6 feet from the floor.
 - 9. Demonstrate the maximum contaminant concentration levels allowed by LEED v4 BD+C.

END OF SECTION

SECTION 01 5813 - TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project identification sign.

1.2 REFERENCE STANDARDS

- A. State of Maryland (IAC/PSCP) - Administrative Procedures Guide, revised February 2017.
- B. State of Maryland (IAC/PSCP) - Memorandum: "Revision to Construction Sign," February 2020.

1.3 QUALITY ASSURANCE

- A. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color.

PART 2 PRODUCTS

2.1 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
- B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
- C. Rough Hardware: Galvanized.

2.2 PROJECT IDENTIFICATION SIGN

- A. One painted construction sign, 48 sq ft area, in accordance with State of Maryland requirements included in this section.
- B. One painted construction sign, 16 sq ft area, identifying local officials.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install sign surface plumb and level, with butt joints. Anchor securely.

3.2 MAINTENANCE

- A. Maintain signs and supports clean, repair deterioration and damage.

3.3 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

INTERAGENCY COMMISSION ON SCHOOL CONSTRUCTION



LARRY HOGAN
GOVERNOR

KAREN B. SALMON, Ph.D.
CHAIRPERSON

ROBERT A. GORRELL
EXECUTIVE DIRECTOR

200 WEST BALTIMORE STREET
BALTIMORE, MD 21201
410-767-0617

WWW.PSCP.STATE.MD.US

PSCP.MSDE@MARYLAND.GOV

MEMORANDUM

TO: All Directors of Facility Planning

FROM: Robert A. Gorrell, Executive Director

RAG

DATE: February 3, 2020

RE: Revision for Construction Sign

Each State funded school construction project shall have a construction sign on the site and a plaque for installation in the school as identified in Appendix E of the IAC/PSCP Administrative Procedures Guide (APG).

On January 8, 2020, Senate President Bill Ferguson was sworn in as the 86th President of the Maryland Senate, resulting in revisions to the construction sign for State funded school construction projects. This revised sign is available through Maryland Correctional Enterprises (MCE) and should be used for State funded school construction projects.

The construction sign should be erected for all State funded school construction projects including all systemic renovation projects, with the exception of Aging School Program (ASP) and Qualified Zone Academy Bond (QZAB) projects less than \$100,000 and State-owned and locally-owned relocatable classroom building projects. This policy is consistent with the requirements of the IAC [Administrative Procedures Guide \(APG\)](#).

Please ensure that the new layout is followed exactly as sent to you, including the same slogan, names, colors, justification, size of lettering, etc. It is strongly recommended that construction signs be purchased through MCE.

MCE can be reached at:

Maryland Correctional Enterprises (MCE) Sign Plant #111

C/O Patuxent Institution

Attention: Charles Behnke, Plant Manager

7555 Waterloo Road Jessup, MD 20794

410-799-5102 - FAX: 410-799-7911

charles.behnke@maryland.gov

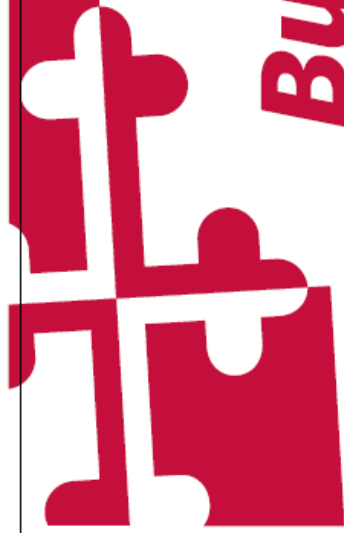
www.mce.md.gov

Please reference the enclosed revised sign template until the Administrative Procedures Guide is updated with the revised information and review this information with your project architects, contractors and consultants.

If you have any questions regarding this matter, please contact Jay Schulte at Jay.Schulte@maryland.gov or (410) 767-0610.

96 in

72 in



Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Building Bright

Futures in Maryland

The State of Maryland and the (Name of County) **Board of Education are:**

(Name of Project)

at the

(Name of School)

Public School Construction Program

Architect: (Name of Architect)

Contractor: (Name of Contractor)

The Maryland General Assembly

Adrienne A. Jones, Speaker of the House
Bill Ferguson, President of the Senate

Board of Public Works

Larry Hogan, Governor
Peter Franchot, Comptroller
Nancy K. Kopp, Treasurer

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Re-use of existing products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

- A. Section 01 3329 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4/V4.1 FOR SCHOOLS: Reporting requirements.
- B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.3 REFERENCE STANDARDS

- A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content.
- B. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- C. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures.
- D. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework.
- E. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines.
- F. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services.

1.4 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.

2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- E. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.
 1. See Section 01 3329 for Contractor's reporting necessary for achievement of targeted LEED v4 certification level.

1.5 QUALITY ASSURANCE

- A. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
 1. Good: Product-specific; compliant with ISO 14044.
 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
- B. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
- C. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
 1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
 4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
 5. Acceptable Evidence:
 - a. For percentage of recycled content, information from manufacturer.
 - b. For cost, Contractor's cost data.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.2 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made outside the United States, its territories, Canada, or Mexico.
 - 2. Made using or containing CFC's or HCFC's.
 - 3. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Result in less construction waste. See Section 01 7419
 - 6. Are made of recycled materials.
 - 7. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
 - 8. Have a published Environmental Product Declaration (EPD).

2.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

2.4 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.1 SUBSTITUTION PROCEDURES

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Use the form(s) in Section 00 4325 - Certification of Compliance.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.
- E. Section 00 2113 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- F. During construction, submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - 1. Substitutions will not be considered under one or more of the following circumstances:
 - a. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - b. Without a separate written request.
 - c. When acceptance will require revisions to the Contract Documents.

3.2 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.

- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.

- H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- I. Comply with manufacturer's warranty conditions, if any.
- J. Do not store products directly on the ground.
- K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- M. Prevent contact with material that may cause corrosion, discoloration, or staining.
- N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products for compliance with EQ Credit 2 for LEED v4.1 BD+C.
- B. Requirements for VOC-Content-Restricted products for compliance with EQ Credit 2 for LEED v4.1 BD+C..

1.2 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings.
 - 2. Interior adhesives and sealants, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings.
 - 2. Interior adhesives and sealants, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Stone.
 - 2. Concrete.
 - 3. Clay brick.
 - 4. Metals that are plated, anodized, or powder-coated.
 - 5. Glass.
 - 6. Ceramics.
 - 7. Solid wood flooring that is unfinished and untreated.

1.3 REFERENCE STANDARDS

- A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.2, 2017.

- B. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board.
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- D. GreenSeal GS-36 - Adhesives for Commercial Use.
- E. SCAQMD 1113 - Architectural Coatings.
- F. SCAQMD 1168 - Adhesive and Sealant Applications.

1.4 SUBMITTALS

- A. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- B. Sustainable Design Requirements: Submit evidence of compliance along with Material Content Form.
 - 1. Refer to Section 01 3329 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4/V4.1 FOR SCHOOLS.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

2.2 LOW-EMITTING MATERIALS

- A. VOC Emissions Evaluation: Provide the following materials compliant with emissions testing in accordance with California Department of Public Health (CDPH) Standard Method v2.1-2017, using the applicable exposure scenario. The default scenario is the private office scenario.
 - 1. Paints and coatings wet-applied within the building interior: Provide at least 75 percent of products in compliance (by volume or surface area).
 - 2. Wall Panels (gypsum board, plaster, wall covering, wall paneling, cubicle curtain, partition wall, doors, window treatments): Provide at least 75 percent in compliance (by material cost or surface area).
 - 3. Flooring installed within building interior. At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.
 - 4. Ceilings (ceiling panel, ceiling tile, gypsum board, plaster, suspended canopy and cloud): Provide at least 90 percent in compliance (by material cost or surface area).
 - 5. Insulation installed within the building interior (thermal and acoustic boards, batts, rolls, blankets, sound attenuation, fire blankets, foamed-in-place, loose-fill, blown, and sprayed): Provide at least 75 percent in compliance (by material cost or surface area).
- B. Composite wood permanently installed within the building interior: Provide at least 75 percent (by material cost or surface area) in compliance with the California Air Resources Board (CARB), Airborne Toxic Control Measure (ATCM), Phase II, for formaldehyde emissions for

ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde (NAF) resins.

1. Exemption: Salvaged and reused architectural millwork more than one year old.
2. Exemption: Plywood made with phenol formaldehyde.
3. Exemption: Structural wood products made with moisture resistant adhesives meeting ASTM 2559, having no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following.
 - a. Plywood: Voluntary Product Standard - Structural Plywood (PS 1-09), Voluntary Product Standard - Performance Standard for Wood-Based Structural Use Panels (PS 2-10), or CARB equivalent to PS 1 or PS 2.
 - b. Oriented Strand Board (OSB): Exposure 1 or Exterior Bond according to Voluntary Product Standard - Performance Standard for Wood-Based Structural Use Panels (PS 2-10).
 - c. Structural Composite Lumber: Structural Glued Laminated Timber (ANSI A190.1-2012).
 - d. I-Joists: Standard Specification Establishing and Monitoring Structural Capacities of Pre-Fabricated Wood I-Joists (ASTM D 5055-13).
 - e. Cross-Laminated Timber: Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15).
 - f. Finger-Jointed Lumber: Labeled "Heat Resistant Adhesive (HRA)" according to American Softwood Lumber Standard (DOC PS-20 2015).

- C. Adhesives wet-applied within the building interior: Comply with VOC content limits below, as expressed in grams per Liter, less water and exempt compounds, of South Coast Air Quality Management District (SCAQMD) Rule 1168 "Adhesive and Sealant Applications," October 6, 2017, or more stringent levels.

1. Indoor Carpet & Pad Adhesives: 50
2. Wood Flooring Adhesive: 100
3. Rubber Floor Adhesives: 60
4. Subfloor Adhesives: 50
5. Ceramic Tile Adhesives: 65
6. VCT and Asphalt Tile (& Linoleum) Adhesives: 50
7. Dry Wall and Panel Adhesives: 50
8. Cove Base Adhesives: 50
9. Multipurpose Construction Adhesives: 70
10. Structural Glazing Adhesives: 100
11. PVC Welding: 510
12. CPVC Welding: 490
13. ABS Welding: 325
14. Plastic Cement Welding: 250
15. Adhesive Primer for Plastic: 550
16. Contact Adhesive: 80
17. Special Purpose Contact Adhesive: 250
18. Structural Wood Member Adhesive: 140
19. Metal to metal substrates: 30
20. Plastic foam substrate: 50
21. Porous substrate except wood: 50
22. Wood substrate: 30
23. Fiberglass substrate: 80
24. All Other Welding & Installation Adhesives: 250

- D. Paints and coatings wet-applied within building interior: Comply with the following VOC content limits as expressed in grams per Liter, less water and exempt compounds, of California Air

Resources Board (CARB) 2007, Suggested Control Measures (SCM) for Architectural Coatings, or SCAQMD Rule #1113 "Architectural Coatings," February 5, 2016.

1. Flat Paint or Coating: 50
 2. Non-flat Paint or Coating: 50
 3. Non-flat - High Gloss Coating: 50
 4. Basement Specialty Coatings: 400
 5. Clear Wood Finishes, Varnish: 275
 6. Clear Wood Finishes, Sanding Sealer: 275
 7. Clear Wood Finishes, Lacquer Sealer: 275
 8. Clear Brushing Lacquer: 275
 9. Concrete Curing Compound: 100
 10. Concrete/Masonry Sealers: 100
 11. Dry-fog Coatings: 50
 12. Fire Resistive Coatings: 150
 13. Floor Coatings: 50
 14. Form-Release Compounds: 100
 15. Graphic Arts (sign) Coatings: 200
 16. High Temperature Coatings: 420
 17. Industrial Maintenance Coatings: 100
 18. Japanese/ Faux Finish Coatings: 350
 19. Low-Solids Coating: 120
 20. Mastic Coatings: 100
 21. Metallic Pigmented Coatings: 150
 22. Multicolor Coatings: 250
 23. Pretreatment Wash Primers: 420
 24. Primers, Sealers and Undercoaters: 100
 25. Reactive Penetrating Sealers: 350
 26. Recycled Coatings: 250
 27. Rust Preventative Coatings: 100
 28. Shellac, Clear: 730
 29. Shellac, Pigmented: 550
 30. Specialty Primers, Sealers, and Undercoaters: 100
 31. Stains: 100
 32. Stone Consolidants: 450
 33. Traffic Coatings: 100
 34. Tub and Tile Refinish Coatings: 420
 35. Waterproofing Sealer: 100
 36. Waterproofing Concrete, Masonry Sealers: 100
 37. Wood Coatings: 275
 38. Wood Preservatives: 350
 39. Zinc Rich Primers: 100
- E. Inherently non-emitting sources (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) that do not include integral organic-based surface coatings, binders, or sealants: Exempt from low-emitting materials requirements.
- F. Methylene chloride and perchloroethylene: Prohibited in paints, coatings, adhesives, or sealants.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- C. Section 07 8400 - Firestopping.

1.3 REFERENCE STANDARDS

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

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Effect on work of Owner or separate Contractor.
 - f. Written permission of affected separate Contractor.
 - g. Date and time work will be executed.

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

1.5 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.6 COORDINATION

- A. See Section 01 1000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and

conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

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

- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.5 CUTTING AND PATCHING

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

- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.6 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.7 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.8 SYSTEM STARTUP

- A. Coordinate with requirements of Section 01 9113 - General Commissioning Requirements, and other individual specification sections.
- B. Coordinate schedule for start-up of various equipment and systems.
- C. Notify Architect and Owner seven days prior to start-up of each item.
- D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- F. Verify that wiring and support components for equipment are complete and tested.
- G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.9 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.

3.10 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.11 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.

- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, overflow drains, area drains, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Owner will occupy all of the building as specified in Section 01 1000.
- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Accompany Project Coordinator on Contractor's preliminary final inspection.
- I. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- J. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7123 - FIELD ENGINEERING

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work on this section.
- B. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Architect for consideration. Those judged to be equal to that specified will receive written approval.
- C. City of Frederick General Provisions and Standard Specifications, latest edition, and as amended.
- D. City of Frederick Stormwater Management Ordinance, latest edition.

1.2 SUMMARY

- A. Work included: Provided at the Contractor's expense, such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
- B. The Contractor shall be responsible for all stakeouts and elevation checks required for construction. All such Work shall be performed by a professional land surveyor. The surveyor shall verify adequacy of benchmarks before starting construction.
- C. Prior to clearing of trees, installing sediment control measures or grading, the Contractor shall conduct an on-site pre-construction meeting. Attendance by the following parties is required:
 - 1. Frederick County Soil Conservation District Sediment Control Inspector
 - a. (301) 695-2803, ext. 3
 - 2. Frederick County Public Schools Representative
 - a. (301) 644-5149
 - 3. Engineer of Record
 - a. (301) 622-4408
 - b. Provide 2 days, minimum, notice.
 - 4. Project Manager, City of Frederick
 - a. (301) 600-6288
 - b. Provide 6 days, minimum, notice.
 - 5. Engineer, City of Frederick
 - a. (301) 600-1405
 - b. Provide 6 days, minimum, notice.
- D. Before the start of any building construction, the Contractor shall have a professional land surveyor locate and stake building corners, driveway entrances, driveways, parking areas and playfields. If there are any discrepancies between the actual layout and the project site plan, they shall be brought to the attention of the Architect and resolved before Work proceeds. A building and site stake out drawing stamped and signed by a professional land surveyor may be submitted in lieu of this preliminary stake out. The Limits of Disturbance "LOD" must be staked prior to the pre-construction meeting.

- E. After the corners of the exterior walls have been started, the Contractor shall obtain a wall check survey certificate made by a professional land surveyor. This survey shall show the accurate location of the building with reference to property lines.
- F. After the first sections of slab-on-grade have been placed in the building, the Contractor shall have a professional land surveyor verify and record the finish floor elevations on the wall check survey.
- G. At the end of the project, the Contractor shall have a professional land surveyor prepare and certify an as-built survey showing the accurate horizontal and vertical locations of all building corners, paved areas, sidewalks, utilities (including inverts), fencing, site walls, and grading, etc. located within the project area.
- H. As-Built survey shall be included in a standard CAD format, such as AutoCAD, and shall include 2-foot contours within the project limits.
- I. The contractor will be responsible for scheduling the Owner's independent testing agent (ITA) during construction of the stormwater management facility and insuring that the ITA completes the necessary stormwater checklist(s) during construction.
- J. The Contractor shall obtain a record drawing, approved by the City of Frederick, of all stormwater management facilities. The Contractor shall have a professional land surveyor, registered in the State of Maryland, prepare an electronic field survey of all stormwater management devices.
 - 1. A complete stormwater management as-built shall also be completed in accordance with the City of Frederick Standard Stormwater Management checklist. The Contractor's surveyor shall certify the as-built survey, and provide a signed and sealed hard copy for submission to the City of Frederick.
 - 2. The Owner's testing and inspection agent shall have their professional engineer certify the construction checklist(s) at the interim and final stages of stormwater management facility construction and provide separate inspection reports for submission to the City of Frederick.
 - 3. Once provided to the Engineer of Record, the electronic survey will be submitted as part of an as-built package to the City of Frederick.
- K. In accordance with the requirements set forth by the City of Frederick, the Contractor will be responsible for preparing and submitting to the project engineer one (1) hard copy and one (1) digital copy of:
 - 1. Final stormwater management facility as-built,
 - 2. Final water meter vault and valve(s) as-built,
 - 3. Testing and inspection checklist(s), and
 - 4. Any additional facility information requested by the City of Frederick.

1.3 RELATED WORK

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
- B. Additional requirements for field engineering also may be described in other Sections of these Specifications.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.5 SUBMITTALS

- A. Comply with pertinent provisions of Section 017800 - Closeout Submittals.
- B. Upon request of the Architect, submit;
 - 1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
 - 2. Documentation verifying accuracy of field engineering work.
 - 3. Certifications, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance with requirements of the Contract Documents.
 - 4. All certifications and surveys described in the Summary section of this specification.

1.6 PROCEDURES

- A. In addition to procedures directed by the Contractor for the proper performance of the Contractor's responsibilities:
 - 1. Locate and protect control points before starting Work on the site.
 - 2. Preserve permanent reference points during process of the Work.
 - 3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
 - 4. Promptly advise the Architect when a reference point is lost or destroyed, or requires relations because of other changes in the Work.
 - a. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
 - b. Locate such replacements according to the original survey control.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

- A. Reduce construction and demolition waste on project site and minimize waste sent to landfills and incineration through implementation of a Construction and Demolition Waste Management Plan as required by LEED v4 Building Design and Construction (LEED BD+C) Rating System and as outlined within this section. Throughout this section, the term LEED is used in place of LEED v4 BD+C: Schools.

1.2 REFERENCES

- A. LEED v4 for Building Design and Construction, with all current addenda.
 - 1. Materials and Resources (MR) Prerequisite 2: Construction and Demolition Waste Management Planning
 - 2. MR Credit 5: Construction and Demolition Waste Management

1.3 PRELIMINARY SUBMITTALS

- A. Prior to any waste removal and within 30 days of Contract award, submit for approval a detailed Waste Management Plan in accordance with LEED MR Prerequisite 2 and Credit 5 requirements and as outlined in this Section.
 - 1. MR Prerequisite 2: Identify at least five materials (both structural and nonstructural) to be targeted for diversion.
 - a. Provide an estimated percentage of the overall project waste that these materials represent, and diversion goals for each.
 - 2. MR Credit 5 Select one of the following additional waste management goals:
 - a. Option 1 - Divert at least 75 percent, of total construction and demolition waste, identifying at least four individual material waste streams, from landfill or incinerator, by weight or volume.
 - 1) Commingled waste is calculated as one material stream unless the sorting facility provides diversion rates for specific materials using weight or volume.
 - b. Option 2 - Reduction of total waste: Limit waste to 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building's floor area.
- B. Describe means and methods to achieve required goal.
 - 1. MR Prerequisite 2 and Credit 5 Option 1:
 - a. Indicate whether materials will be separated on site or comingled.
 - 1) Identify recycling contractors and haulers proposed for the project and locations accepting waste materials or entities providing related services.
 - 2) Describe how the recycling facility will process the material.
 - 3) Comingled sorting facilities: Provide end destination and intended use for diverted materials.
 - (a) For multiple waste streams: Provide statement that project specific diversion rates will be provided, by weight or volume.
 - (b) For one comingled waste stream: Provide average annual recycling rate for the facility provided by the regulating local or state government authority. Confirm alternative daily cover (ADC) is excluded from the average annual rate.

- (c) Visual inspection is not an acceptable method of inspection for purposes of documenting percentage of comingled waste diverted from landfill.
- b. MR Credit 5 Option 2: Describe source reduction strategies.

1.4 INFORMATIONAL SUBMITTALS

- A. With each Application for Payment, submit waste management progress reports, demonstrating MR Credit 5: Construction and Demolition Waste Management.
 - 1. Project title, name of party completing report, and dates of period covered by the report.
 - 2. Option 1: Amount (by weight or volume) of recycled and/or salvaged construction and demolition waste to date, include the identified four material streams.
 - a. Exclude excavated soil, land-clearing waste from calculations.
 - b. Include materials destined for alternative daily cover (ADC) as landfilled waste.
 - c. Include wood waste converted to fuel (biofuel) or waste-to-energy as diverted from landfill in calculations.
 - 1) Exclude all other types of waste-to-energy from calculations.
 - d. Comingling sorting facilities: Provide summary of diversion rates, type of materials recycled and description of the end destination of the recycled materials.
 - 3. Option 2: Calculate waste generated per square foot of building floor area.
 - a. Exclude materials reused on site.
 - b. Include all materials donated, sent to reuse facility or reused off-site.
 - c. Include all materials sent to recycling facilities, landfills and incinerators.

1.5 CLOSEOUT SUBMITTALS

- A. LEED Online: At completion of construction and prior to contract closeout, complete the LEED Online Form to the LEED Online Project Database for MR Prerequisite 2 and Credit 5: Construction and Demolition Waste Management and upload the associated required documentation
 - 1. MR Prerequisite: Construction and Demolition Waste Management Plan and summary of diversion report.
 - 2. For Demolition Phase work performed under separate contract: Include information provided by Owner in MR waste calculations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Training and Coordination:
 - 1. Furnish copies of approved Waste Management Plan to all on-site supervisors, each subcontractor, Owner, and Architect.
 - 2. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.
 - 3. Meetings: Include construction waste management on the agenda of all required regularly scheduled construction meetings.
- B. Facilities: Provide designated facilities for co-mingling or separation and storage of materials for recycling, salvage, reuse, return, donation and waste disposal, per approved Waste Management Plan for use by all contractors and installers.

1. Provide adequate space, convenient to subcontractors, for pick-up and delivery.
 2. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.
- C. Records: Maintain on-site logs for each load of materials removed from site:
1. Include type of material, load (by weight or volume), recycling/hauling service, and date accepted by service or non-profit receiver.
 - a. Comingling waste as a single stream: provide documentation of percentages of diverted waste from the sorting facility for the corresponding month.
 - b. Comingling waste as multiple streams: provide documentation of percentages of individual waste streams based on weight or volume.
- D. Methods of waste disposal that are not acceptable for LEED compliance:
1. Burning or incinerating on or off project site, except as described in PART 1 of this section.
 2. Burying on project site, other than fill.
 3. Dumping or burying on other property, public or private, other than official landfill.
 4. Illegal dumping or burying.
- E. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
1. Materials qualifying as reused for MR Credit 1: Building Life-Cycle Impact Reduction or MR Credit 3: Building Product Disclosure and Optimization (BPDO) - Sourcing of Raw Materials may contribute to calculations for MR Credit 5 Construction and Demolition Waste Management as part of the waste diversion calculation.
 2. Concrete, masonry and asphalt crushed and reused on-site contribute to MR calculations for Construction and Demolition Waste Management as diverted waste and do not contribute to MR Credit 3: BPDO - Sourcing of Raw Materials as reused materials.
 - a. MR Credit 3: 100 percent recycled content and regional content.
 - b. MR Credit 5: 100 percent diverted from land fill.
 3. Projects incorporating existing building components but do not meet the requirements of MR Credit 1: Building Life-Cycle Impact Reduction: Building and Material Reuse may apply the reused portions of the existing building toward MR Credit 5: Construction and Demolition Waste Management as part of the waste diversion calculation.
 4. Reused materials do not contribute to MR Credit 5: Construction and Demolition Waste Management, Option 2.
- F. Salvage of Materials: Set aside, sort, and protect products to be salvaged for reuse off-site.
- G. Hazardous Waste Handling: Separate, store and dispose of hazardous wastes separately from other materials and in accordance with local regulations.

END OF SECTION

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.2 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two hard-copy sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.

- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Include test and balancing reports.
- J. Additional Requirements: As specified in individual product specification sections.

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.6 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Electrical systems and equipment.
 - 4. Conveying systems.
 - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

- A. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 - 4. Include Commissioning Authority's formal acceptance of training session.
- E. Video Recordings: Owner to provide digital video recording service for each demonstration and training session.

1.4 QUALITY ASSURANCE

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
 1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 9113 GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Commissioning requirements common to all Sections.
- B. Systems and equipment startup and documentation.
- C. Validation of proper and thorough installation of systems and equipment.
- D. Development and execution of pre-FPT checklists.
- E. Performance Verification Testing.
- F. Functional Performance Testing.
- G. Documentation of tests, procedures, and installations.
- H. Coordination and requirements of training events.
- I. Management of Record Construction Documentation.
- J. Sequencing.
- K. LEED Requirements

1.2 GENERAL DESCRIPTION

- A. Commissioning (Cx) is the process of ensuring that all building systems are installed and perform interactively according to the design intent; that systems are efficient and cost effective and meet the Owner's operational needs; that the installation is adequately documented; and that the Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance the building systems from installation to full dynamic operation and optimization.
- B. Commissioning Authority shall work with the Contractors, the CM and the Design Team to direct and oversee the Cx process.
- C. The Commissioning Plan outlines the commissioning process beyond the Construction Documents. The specification sections dictate all requirements of the commissioning process relative to the construction contract. The Cx Plan is available for reference at the request of the Contractor; however, it is not part of the construction contract.
- D. This Section and other Sections of the specification detail the Contractor's responsibilities relative to the Cx process.

1.3 SCOPE

- A. This Section covers elements, requirements, procedures, and protocols common across all Divisions of the work. Requirements specific to individual Sections are specified in the technical specification as well as a dedicated Section for Divisions 23, namely “23 0800 - Mechanical System Commissioning” and “23 0859 – Building Automation System Commissioning.”
- B. The following sections include building commissioning activities and documentation in support of the U.S. Green Building Council (USGBC) LEED™ rating program:
 - 1. Commissioning activities and documentation for the LEED™ section on “Energy and Atmosphere” prerequisite of “Fundamental Commissioning and Verification.”
 - 2. Commissioning activities and documentation for the LEED™ section on “Energy and Atmosphere” credit for “Enhanced Commissioning.”
- C. Specific systems to be commissioned are indicated in the following Divisions of the Specification:
 - 1. Division 23 - Mechanical: Requirements for commissioning are specified in Section 23 0800 as well as in individual Division 23 Sections.
 - 2. Building Automation Systems (BAS): Requirements for commissioning are specified in Section 23 0859.
 - 3. Electrical Systems: Requirements for commissioning are specified in Section 26 0800

1.4 RELATED WORK AND DOCUMENTS

- A. Commissioning Plan (Cx Plan): The Cx Plan shall be available for reference as it outlines responsibilities outside of the Construction Contract. It gives the Contractor a perspective as to the overall process. It encompasses the entire commissioning process including design phase and post-construction tasks.
- B. Section 01 4000 – Quality Requirements: Specifies the contractor’s requirements and responsibilities for testing and re-testing.
- C. Section 01 3000 – Administrative Requirements: Addresses documentation and procedures relative to the commissioning process, including Operation and Maintenance Manuals.
- D. Section 01 5000 – Temporary Facilities and Controls: Specifies the requirements for using Owner’s existing and/or permanent equipment and controls for temporary conditioning in the facility.
- E. Section 01 7800 – Closeout Submittals: Defines the milestones in completion incorporating the commissioning process.
- F. Section 01 3329 – Sustainable Design Requirements – LEED v4/v4.1: Provides LEED™ requirements for the project delivery.
- G. Section 01 9115 – Functional Performance Testing Procedures: Provides ‘generic’ functional performance testing procedures to illustrate the level-of-effort expected during acceptance testing.
- H. Individual Specification Sections: Individual sections stipulate installation, startup, warranty, O&M documentation, and training requirements for the system or device specified in the Section.
- I. Section 23 0859 – Building Automation Systems Commissioning: Details the commissioning procedures specific to the Building Automation System.

- J. Section 23 0800 – Mechanical Systems Commissioning: Details the commissioning procedures specific to Division 23 work.

1.5 DEFINITIONS AND ABBREVIATIONS

- A. Acceptance Phase: This is the phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented; and when most of the Performance Verification and Functional Performance Testing and some final training occurs. The Acceptance Phase requires certification by the contractor that the systems have been started up in accordance with the approved protocols and the submission of the documentation of that startup, and completion of Pre-FPT checklists. The Acceptance Phase ends with either (the successful completion of all functional performance testing and sign off by the CA.
- B. A/E: General reference to the Architect/Engineer lead-design entity.
- C. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers.
- D. Automatic Temperature Controls Contractor (BAS): Contractor responsible for providing the Building Automation System and automatic temperature controls specified in Section 23 09 00.
- E. Basis of Design (BoD) Document: The Basis of Design document is prepared by the Engineer of Record and shall respond to, and be consistent with, the performance criteria specified in the Owner's Project Requirements (OPR). The BoD illustrates the means by which OPR criteria are to be achieved, documenting the assumptions and parameters used in the design, and documenting the primary thought processes or decisions made that resulted in the selected alternatives. At the end of the project, the final BoD may be incorporated into the Systems Manual if desired in part or in its entirety.
- F. The BAS (or FMS) references below are 2 common ways to reference the building automation or DDC control system. Edit definitions and references throughout this document accordingly if the client has a preferred way to designate these systems.
- G. Building Automation Contractor (BAC): Contractor responsible for work in section 23 09 00. Also referred to as ATC Contractor.
- H. Building Automation System (BAS): Computer-based control or automation system. May also be referred to as the EMS.
- I. Commissioning (Cx): The process of ensuring that all building systems perform interactively according to the design intent, that systems are efficient and cost effective and meet the Owner's operational needs.
- J. Commissioning Authority (CA): The Party retained by the Owner who will oversee the commissioning process, develop and stipulate many of the commissioning requirements, manage the commissioning process, and ensure and validate that systems and equipment are designed, installed and tested to meet the Owner's requirements.
- K. Commissioning Coordinator (Cx/C): This refers to the Individual within each of the various Parties that is designated the Point-Of-Contact for that Party relative to commissioning activities.
- L. Commissioning Portal: This is an internet hub for the sharing of commissioning information. This portal will act as a hub for posting electronic information.

- M. Commissioning Specifications (Cx Specs): Includes separate commissioning specification sections and commissioning-related subsections of other specifications. All Contractor requirements relating to commissioning should be conveyed within the Cx Specs. Commissioning Specs should be referenced but not duplicated within the Commissioning Plan (which is designed to govern non-Contractor-related issues).
- N. Commissioning Team (CxT): Consists of the parties involved in the commissioning process for all systems to be commissioned. The Commissioning Team will include a core group involved with all systems. This core group will typically include the Commissioning Authority, the Owner's Commissioning Coordinator, and the Construction Manager's Commissioning Coordinator. On any given system, the Commissioning Team will also include the Commissioning Coordinator for the contractor(s) responsible for the system or equipment.
- O. Contractor: 'Contractor' is a general reference to the Installing Party and can therefore refer to the Construction Manager, subcontractors, or vendors as inferred by its usage.
- P. Construction Manager (CM): The party acting as the primary coordinator of all the prime contractors (Mechanical Contractor, Electrical Contractor, etc.).
- Q. Construction Phase: Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete the installation, startup, startup documentation, Pre-FPTs, submit O&M information, establish trends, and perform any other applicable requirements to get systems started. Contractors and Vendors may also conduct equipment specific training. The Construction Phase will typically end upon completed startup and TAB of systems and equipment.
- R. Contract Documents: The documents governing the responsibilities and relationships between parties involved in the design and construction of the project including (but not necessarily limited to):
- S. Contracts: A legally binding agreement reached between two parties.
- T. Construction Plans and Drawings: A set of drawings that define the scope of the project.
- U. Specifications: Define the exact requirements of the project, products and processes.
- V. Addenda: Document or information attached or added to clarify, modify or support the information in the original document or written work.
- W. Change Orders: Work that is added or removed from the original scope of work.
- X. Commissioning Plan: The master planning, management and communications tool related to commissioning, setting out scope, standards, roles and responsibilities, expectations, deliverables, etc., and is addressed to all members of the Commissioning Team.
- Y. Construction Documents: Refers to the Contract Documents that dictate the details of the installation.
- Z. Deficiency: A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).
- AA. Owner's Project Requirements (OPR): The OPR defines the benchmark by which the success of the project is ultimately judged. It provides a detailed explanation of the ideas, concepts, and

criteria that are deemed by the Owner to be important. The Basis of Design prepared by the Engineer of Record articulates how the requirements of the OPR will be met in the design. At the end of the project, the final OPR will be incorporated into the Systems Manual.

- BB. Electrical Contractor (EC): Contractor responsible for Division 26 work
- CC. Energy Management System (EMS): Alternate reference to the computer-based control or automation system. May also be referred to as the BAS.
- DD. Exception Records: Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item.
- EE. Factory Authorized Representative: An individual fully trained on the equipment and certified by the manufacturer to perform the respective task.
- FF. Factory Testing: Testing of equipment off-site at the manufacturer's facility. May be witnessed by the members of the project team.
- GG. Field Testing by Factory Authorized Representative: On site testing of equipment conducted by a factory authorized representative.
- HH. Functional Completion: A milestone that marks the completion of the Acceptance Phase and successful completion of the FPTs by the CA.
- II. Functional Performance Testing (FPT): The detailed and thorough testing of the building systems and the components and equipment making up those systems. References made to FPT throughout the documents are inclusive of Integrated Systems Testing (IST) unless specifically indicated otherwise.
- JJ. IAQ: Indoor Air Quality
- KK. Integrated Systems Testing (IST): The detailed and thorough testing of the interactions of various systems in the building. ISTs are considered a subset of the overall concept of FPT and therefore references made to FPT will include ISTs unless specifically indicated otherwise.
- LL. Manufacturer's Representative: Either an individual in direct employ of the manufacturer of the applicable system, or an individual who is certified by that manufacturer to perform the applicable work for which the reference is made. This is synonymous with Factory Authorized Representative.
- MM. Mechanical Contractor (MC): Contractor responsible for Division 23 work
- NN. O&M Documentation: Contractor-developed documentation designed to address the needs of facilities personnel and customized for the context of the specific facility and installation. The foundation of O&M Documentation is manufacturer's literature (including 'O&M Manuals', parts lists, troubleshooting guides, etc.) as well as Contractor-developed instructions for startup and shut-down, sequences, and other installation-specific information.
- OO. O&M Manuals: Compilation of O&M documentation,
- PP. Opposite Season: The season opposite of when the majority of the testing occurs. Also referred to as "Seasonal Testing".

- QQ. Performance Verification Testing (PVT): Testing in advance of Functional Performance Testing performed by BAS contractor at the direction of the CA. Includes a detailed field inspection and 'point-to-point' testing of all equipment to verify proper installation.
- RR. Point of Contact (POC): General reference to the key individual within a given entity.
- SS. Project Phases: Phases of the project include the Construction Phase, Acceptance Phase, and Warranty Phase.
- TT. RFI: Request for Information
- UU. Startup: Refers to the quality control process whereby the Contractor verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the manufacturer's startup checklist, energizes the device, verifies that it is in proper working order and ready for dynamic testing, and completes the required startup checks, tests and adjustments.
- VV. Startup Checklist Item: A list of items provided by the manufacturer of a device or piece of equipment used to verify proper installation of equipment or systems by the Contractor. Checklist items simply require a 'Yes/No' or 'OK/Not' response. These include primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension checked, oil levels OK, gages in place, sensors calibrated, etc.). Startup Checklist items are one component of the Startup Process (Startup Tests being the other).
- WW. Startup Procedures: Refers to the combination of Startup Checklists and Startup Tests. Startup Procedures are typically performed by the Contractor with or without a formal Cx process. The Contractor documents the startup process by completing and submitting the Startup Procedures. Startup procedures may be a combination of those prepared by the CA, those included in the contractor's quality assurance process, and those required by the manufacturer.
- XX. Startup Test: This is a test that may be a part of equipment startup. It differs from a checklist item in that it requires more than a binary response - an observation, measurement, or sequence of events must be documented. Startup Tests are one component of Startup Procedures (Startup Checklists being the other).
- YY. Systems Manual: The Systems Manual is a LEED requirement and is a commissioning process deliverable that provides the information needed to understand, operate, and maintain the facility and its systems. It should be the repository of all updates and corrections as they occur (even through occupancy). The Systems Manual expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process.
- ZZ. TAB: Refers to the test, adjust, and balance process or the Testing, Adjusting, and Balancing Contractor.
- AAA. Testing Agency: An independent agency typically retained by the Contractor to perform specialized testing of systems or equipment (most commonly electrical). The Testing Agency shall be qualified and equipped to perform the testing and shall submit appropriate qualifications.
- BBB. Trending: Monitoring and recording a history of parameters typically using the building automation system.

CCC. Vendor: Refers to the organization that sells a system or piece of equipment to the subcontractor. This may be a branch office of the manufacture or a value-added reseller.

DDD. Warranty Phase: Includes the early occupancy of the building and can continue through the Warranty Period and at least into the opposite season from when it was initially tested. The CA conducts a 10-month warranty review with building occupants and operations and maintenance personnel.

1.6 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1-2007, "HVAC&R Technical Requirements for the Commissioning Process"
- B. ASHRAE Guideline 0-2005, "The Commissioning Process"
- C. ASHRAE Guideline 4-2008, "Preparation of Operating and Maintenance Documentation for HVAC&R Systems"
- D. NEBB - Procedural Standards for Whole Building Systems Commissioning of New Construction
- E. LEED v4 for Building Design and Construction.

1.7 DOCUMENTATION

- A. CM (or Contractors where indicated) shall provide the following documentation for CA review per the procedures specified herein and in other Sections of the specification:
 - 1. Shop Drawings and Product Data: CA shall be provided shop drawings and submittal data for systems and equipment that will be part of the Cx process. Some of these submittals will be reviewed by the CA and others are only needed for record. CA will mark up the Submittal Register to indicate what is required.
 - a) Submittals for Review: CM shall provide the CA with an electronic copy of Shop Drawings and Product Data concurrent with distribution to the A/E.
 - b) Submittals for Record: CM shall provide to the CA the final electronic record copy of the submittal.
 - 2. Draft Startup Procedures: Contractor shall develop Startup Procedures for all applicable equipment and systems along with the manufacturer's application, installation and startup procedures. CA will review draft and recommend approval.
 - 3. Factory Test Reports: Contractor shall provide any factory testing documentation or certified test reports required by the specifications. These shall be provided prior to Acceptance Phase.
 - 4. Schedule Updates: CM shall issue periodic updates to the construction schedule. Provide to the CA at least every two weeks. Contractor shall use schedule to notify Cx Team of scheduled startup and training activities.
 - 5. Exception Record Response: Contractors shall respond to Exception Records for which they are assigned responsibility.
 - 6. Testing and Balancing Reports. Provide all documentation of work of TAB contractor. Documentation shall be provided prior to Acceptance Phase.
 - 7. Completed Startup Procedures: Completed Startup Procedure documentation for all applicable equipment and systems. CA will review prior to FPT.
 - 8. Pre-FPT Checklists: Provide prior to the start of the Acceptance Phase.
 - 9. Equipment Warrantees: Provide prior to the start of the Acceptance Phase.
 - 10. Training Plan: Provide prior to the start of the Acceptance Phase.

11. Record Training Documentation: Provide at least 7 days prior to the start of the applicable Functional Performance Testing. The compiled and final record training documentation will be provided by the CM within 14 days of the last training session provided under the construction contract (this will typically be the site-specific controls training). This will take the form of the Training Plan supplemented with evaluations and actual dates and topics.
 12. Systems Manual Content: Provide Systems Manual content per the requirements of this section and Division 1 requirements.
- B. Coordinate the record drawings submittal logistics with the rest of the specification. Preferably facilitate electronic sharing of documentation between all parties and possibly a web posting of the drawings.
 - C. Record Drawings: Contractor shall maintain at the site an updated set of record or 'As-Built' documents reflecting actual installed conditions and all approved changes and modifications to the contract documents. Contractor shall provide access to the CA to review the As-Built and Record Drawings. Provide Record Drawings in accordance with Division 1.
 - D. CA to provide a Final Commissioning Report and LEED™ documentation
 1. Final Commissioning Report: Compile final commissioning report. Summarize all of the tasks, findings, and recommendations of the commissioning process.
 2. Documentation: Compile LEED™ documentation. Format as required by USGBC for submittal under the referenced green building rating system.
 3. LEED™ Online: Complete all commissioning related online forms and post required documentation to LEED™ online.

1.8 COMMISSIONING SEQUENCING AND SCHEDULING

- A. In order to expedite project completion, various systems can be in different stages of the commissioning process simultaneously. CA and Contractor shall cooperate to schedule the Cx tasks to minimize the duration of the Cx activities.
- B. The Commissioning will be categorized into Phases as indicated below:
 1. Construction Phase: This is the period of time when the systems are installed, much of the commissioning documentation is developed, the systems are started, pre-FPTs are executed by the contractors and training may be conducted. For any given system or area, the Construction Phase will end when the CA approves proceeding with Performance Verification and Functional Performance testing.
 2. Acceptance Phase: This is the period of time where the systems will undergo Performance Verification Testing and Functional Performance Testing.
 3. Warranty Phase: This is the period of time that coincides with the start and end of the contractor's base warranty.
- C. Prior to submission of the baseline schedule, CM will coordinate with the Commissioning Authority to specifically include the detailed tasks involved in the commissioning (Cx) process. Commissioning Authority will provide an initial commissioning schedule that outlines the optimal commissioning process. CM's scheduler shall meet with the Commissioning Authority and the subcontractors to synthesize the commissioning schedule with the general construction process constraints and integrate the agreed upon process into the main construction schedule.
- D. The Cx Schedule will outline generic Cx tasks with precedents or prerequisites to each task. The Cx schedule will also indicate system precedent requirements for startup and acceptance

testing. Contractor shall collaborate with the CA to determine impacts of project phasing as applicable. Examples of enumerated tasks include:

1. Contractor preparation of draft Startup Procedures.
 2. Contractor preparation of Training Plan.
 3. Preparation of Systems Manual content.
 4. Testing Agency activities.
 5. Electrical Startup by system and zone (or phase).
 6. Mechanical startup by system and zone (or phase).
 7. Controls Startup by system and zone (or phase).
 8. TAB activities by system and zone (or phase).
 9. Training Events
 10. Performance Verification by Commissioning Agent
 11. Functional Testing Dry-Run by BAS Contractor
 12. Functional Testing by system and zone (or phase).
 13. Occupant or Regulatory Agency testing or approval process.
- E. Contractor shall completely install, thoroughly inspect, startup, test, adjust, and balance systems and equipment. All activities shall be documented per specified procedures and progress tracked on the construction schedule. Contractor shall notify A/E, Owner, and CA in writing that systems are complete and ready for verification and functional performance testing. CM shall schedule and conduct Formal Witnessed Startups of all systems and equipment in the Cx scope as specified below.
- F. Contractor shall notify CA at least 14 days in advance of any tests, startups, or training. CA shall witness selected tests and startups. Notification shall be accompanied by a schedule showing the coordinated start date and task duration and all currently open precedent requirements.

1.9 ELECTRONIC RECORD SUBMITTALS

- A. Within 30 calendar days after receipt of approval from the Architect on any submittal, for equipment in Division 23, Contractor shall submit a final electronic version of the submittal for future asset management.
- B. Final electronic submittals shall:
1. Be originally authored in electronic media and not scanned versions with hand mark ups unless specifically approved by the Architect.
 2. Be provided in Portable Document Format (*.pdf) with selectable text and graphics that are readable. The documents shall be merged into one bookmarked document up to 500 mb. Merged documents shall use hierarchical bookmarks to form a table of contents and provide hyperlinks to the subject topic. For submittals larger than 500 mb, provide a summary document in PDF or HTML format with relative hyperlinks to the associated document files within the same directory or in directories subordinate to the summary document.
 3. Include all final ratings, parameters, specifications, options, etc. In the case where the Architect returns the submittal "Approved As Noted, Resubmission Not Required" and includes mark-ups or comments that change the originally submitted ratings, parameters, specifications, options, etc., the Contractor shall correct the documents in the original electronic document prior to submitting the final electronic documents.
 4. Highlight the specific rating, parameter, specification, option, etc. when the original document includes multiple alternatives. For instance, when a range of performance parameters are given, or various sizes are shown, or various options are listed, the applicable item shall be indicated by highlight, circle, pointer, etc.

5. Not necessarily include generalized direction from the Architect that does not related to ordering and purchasing the equipment. For instance, notes like, coordinate with xxx for final motor horsepower are not to be transferred to the electronic submittal. In that example only, the final coordinated sizes would be indicated.
- C. Final Electronic Submittals shall be either posted to the project web site or provided on compact disc.

1.10 COORDINATION MANAGEMENT PROTOCOLS

- A. Coordination responsibilities and management protocols relative to Cx are initially defined below but will be refined and documented in the Construction Phase Cx Kick Off meeting. Contractor shall have input in the protocols and all parties will commit to process and scheduling obligations. The CA will record and distribute.
1. Submittals and Shop Drawings: CM shall distribute these to the CA. CA shall edit the Submittal Log to communicate which submittals must be forwarded.
 2. CA Review Comments on Shop Drawings: Posted on the electronic forum and a copy sent directly to the A/E and CM by the CA. A/E to consider and incorporate at their discretion.
 3. Deficiencies Identified by the CA: When the CA identifies a deficiency, the CA shall make a good faith assessment of responsible parties. Those parties, as well as the CM, shall be notified of the perceived deficiency. This communication is FOR INFORMATION ONLY and is not a direction to resolve the deficiency. Contractor may accept responsibility and resolve the deficiency voluntarily. If contractor contests either the deficiency or responsibility for that deficiency, Contractor shall respond to that deficiency indicating disagreement. If responsibility is not agreed to via the Cx dialogue, Owner or CM shall issue a work directive or RFI via the normal contractual channels to resolve the issue.
 4. Requests for Meetings: In general, requests by the contractor for a meeting with the CA shall be routed through CM who will then determine the validity. Note that every attempt should be made to deal with Cx issues at regularly scheduled Cx Meetings.
 5. Control Sequence Modifications: CA shall make every attempt to thoroughly review the sequences during the submittal phase and address any issues prior to the submittal approval. However, CA and the BAS Contractor may incorporate minor changes to the sequence during testing when it is apparent that it improves the control of the equipment but does not fundamentally change the intent of the sequence. The time required by the BAS Contractor for this type of modification is addressed in Section 23 0859. Any and all changes must be thoroughly documented in the record documents.
 6. Scheduling Coordination – CA shall consult directly with the CM to incorporate the Cx tasks in the project schedule. The process logic and integration shall ultimately be collaboration between CM, CA, and contractors. The effort will start with CA and CM proposing initial logic. Then subcontractors will join the discussion and work out the final details, (precedent logic and durations).
 7. Notification of Completion Milestones – Contractor shall notify Owner and CM at least two weeks prior to an anticipated Cx activity or Cx milestone (such as readiness for FPT). CM shall then coordinate the scheduling of the activity (as applicable) between all required parties as necessary. Notification shall be communicated in an agreed upon format as determined during the Cx process.
 8. Exceptions Record: CA maintains a categorized Exceptions Record which tracks the Cx-related items. The Exceptions Record will be available to all parties who have credentials on the portal. Any party with credentials may respond to an Exception Record. Any party that is copied on an email resulting from an Exception Record posting may respond to it and contribute to the dialogue.
 9. Startup Checklist and Test Documents: The contractor shall submit the manufacturer's startup procedures and checklists to the CA for review and approval. The Contractor then

performs the approved Startup procedures, completes the documentation and signs it, and submits it. CA may subsequently spot check the procedures and documentation. They are then included in the Commissioning Record.

10. Functional Performance Test Documents: Functional performance tests are prepared and completed by the CA. They are developed during the construction phase after completed submittals have been received and approved. CA forwards the FPT procedures to the Cx Team. Contractors approve the procedures and/or identify any portion of the procedures that cannot be performed for technical, scheduling or other reasons. Throughout the Cx process, CA maintains a current record of the testing procedures and keeps the documentation up to date and accessible for all to access the current progress.

1.11 CONTRACTOR RESPONSIBILITIES

- A. Construction Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Construction Phase.
 1. Include Cx requirements in price and plan for work.
 2. Designate a Cx Coordinator (CxCo) from each major subcontractor with activities related to commissioning. These Cx Coordinators are to be the primary contacts for Cx activities.
 3. Attend Construction Phase Cx Kick Off Meeting. The Cx Coordinator and Project Manager from each major subcontractor shall attend at a minimum.
 4. The Cx Coordinator shall attend all Cx progress meetings unless otherwise agreed to by the CA.
 5. Remedy any deficiencies identified throughout construction.
 6. Prepare and submit required draft Startup Procedures and submit along with the manufacturer's application, installation and startup information.
 7. TAB shall submit sample balancing forms for approval prior to starting work.
 8. Schedule and coordinate Cx efforts into the construction schedule. Incorporate the precedent diagram provided by the CA into the construction schedule. Indicate at a minimum all tasks enumerated on the precedent diagram for all systems.
 9. Coordinate the work of subcontractors, vendors, manufacturers, and Testing Agencies provided under Contractor's contract, and ensure that these parties are informed of and are adhering to the requirements of the Cx process specified throughout the contract documents. Particular reference is made to providing the required Systems Manual; to submittal of training materials and documentation of that training; to collaboration with the overall startup and testing process; to developing comprehensive integrated procedures for scheduling and task notification and documenting them in a common format; and to electronic delivery requirements if applicable.
 10. Develop and submit Temporary Conditioning Plan.
 11. Provide assistance to the CA in preparation of specific Functional Performance Test (FPT) procedures. Contractors, subcontractors and vendors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests. Damage caused to equipment performed in accordance with the approved procedures will be the responsibility of the Contractor.
 12. Thoroughly complete and inspect installation of systems and equipment as detailed throughout Contract Documents, as required by reference or industry standards, and as specifically indicated elsewhere in this section.
 13. Startup, test, adjust, and balance systems and equipment prior to verification and performance testing by the Commissioning Authority. Startup procedures shall be in accordance with Contract Documents, reference or industry standards, and individual Cx specifications. Provide skilled technicians qualified to do the work required. Provide factory trained/authorized technicians where required by the contract documents and stated in the applicable technical section. Startup and testing shall proceed from device checkout, to component checkout, to system checkout, to inter-system checkout.

14. Prepare spaces with adequate security for onsite contractors to store equipment. TAB, CA, BAS will need space to conduct business and will not justify the cost of their own facilities.
 15. Schedule for representative space mock ups as early as possible to facilitate determining standards for close out
 16. Record startup and testing procedures on startup forms or checklists and certify that the systems and equipment have been started and or tested in accordance with the requirements specified above. Each task or item shall be indicated with the party actually performing the task or procedure.
 17. Provide skilled technicians qualified to perform the work required.
 18. Provide factory-trained and authorized technicians where required by the Contract Documents.
 19. Record Startup Procedures on startup procedure forms and certify that the systems and equipment have been started and or tested in accordance with the requirements specified above. Each task or item shall be indicated with the Party actually performing the task or procedure.
 20. Tag equipment that is started with the Individual's name and date.
 21. Demonstrate the operation of all systems as specified.
 22. Certify that systems have been installed and are operating per Contract Documents prior to Acceptance Testing.
 23. Maintain an updated set of Record Documentation as required by the Contract Documents.
 24. Copy the CA on indicated documentation.
- B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Acceptance Phase.
1. Perform performance verification of BAS system as specified in section 23 0859.
 2. Assist CA in functional performance testing. Assistance will typically include the following:
 - a) Manipulate systems and equipment to facilitate testing.
 - b) Provide any specialized instrumentation necessary for functional performance testing.
 - c) Manipulate BAS and other control systems to facilitate functional performance testing.
 3. Correct any work not in accordance with Contract Documents.
 4. Participate in Training Events.
 5. Maintain record documentation, and update and resubmit it after Compensate CA for additional site time required to complete or repeat testing due to incompleteness of systems or equipment at time of Functional Performance Testing.
 6. Monitor systems, equipment and areas until Final Acceptance by Owner. Log and diagnose all alarms during this period. Maintain trends and logs of all critical parameters. Forward the logs and trends on a weekly basis throughout all Endurance Periods.
- C. Warranty Phase: The following delineates the commissioning-related responsibilities of the Contractor (and their subcontractors) during the Warranty Phase.
1. Provide warranty service;
 2. Conduct BAS Sequence Training;
 3. Respond to and document Warranty issues;
 4. Participate as required in the opposite season testing;
 5. Correct any deficiencies identified throughout the Warranty Phase;
 6. Update record documentation to reflect any changes made throughout the Warranty Phase and resubmit final Record Drawings at the close of the Warranty period.

1.12 EQUIPMENT SUPPLIER/VENDOR RESPONSIBILITIES

- A. Construction Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Construction Phase.
 - 1. Provide shop drawings and product data in hard copy and electronic format.
 - 2. Provide manufacturer's application, installation and startup instructions within 30 days of shop drawing/product data approval.
 - 3. Participate in controls coordination meetings or conference calls to ensure integration of equipment/systems as required by the Contract Documents.
 - 4. Where factory-authorized startup is specified, coordinate and participate in the specified commissioning process and document startup on the appropriate forms.
 - 5. Review and approve Functional Test Procedures affecting supplied equipment.
 - 6. Where training is to be provided by factory-authorized personnel, provide required Training Plan information including course content for approval prior to conducting the training.
 - 7. Conduct and document training vents as required by this Section, and by applicable sections of the Specifications pertaining to each piece of equipment or system.
 - 8. Provide spare parts and materials as required by Specifications.
 - 9. Provide special tools as required by the Specifications.
 - 10. Provide Systems Manual content as required and develop project-specific O&M content as required by the Cx requirements.
 - 11. Provide all warranties.
- B. Acceptance Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Acceptance Phase.
 - 1. Participate in any Functional Testing Procedures required.
 - 2. Consult on issues identified relative to the supplied equipment.
- C. Warranty Phase: The following delineates the commissioning-related responsibilities of the Equipment Supplier (and their subcontractors) during the Warranty Phase.
 - 1. Provide any warranty service required to the supplied equipment.
 - 2. Maintain Systems Manual content relative to supplied equipment.
 - 3. Provide technical support to the Owner's facilities personnel.

1.13 COMMISSIONING KICK OFF / COORDINATION MEETING

- A. CA shall schedule and conduct a Cx coordination meeting near the beginning of construction. The following should be discussed at this meeting:
 - 1. CA will present:
 - a) Commissioning Documents
 - b) Commissioning Requirements
 - c) Responsibilities of the construction parties
 - d) Management protocols
 - e) Required submittals
 - f) Schedule

1.14 STARTUP PROCEDURES AND DOCUMENTATION

- A. Purpose: The Cx process requires documentation that the normal quality control processes involved with preparing systems and equipment for operation are properly performed and thoroughly documented.

- B. Startup Procedures: Startup Procedures (consisting of checklists and tests as above) for each type of equipment and system shall be submitted to the CA for review and approval prior to startup.
- C. 'Generic' Startup Procedures: Refer to Section 23 0800 and the Commissioning Plan for generic Startup Procedures for a variety of mechanical and electrical systems. The content of these Startup Procedures shall provide the minimally acceptable content.
- D. Startup Forms and Checklists: Contractor and Vendors shall provide manufacturer's standard startup checklists, forms, and protocols for review early in the construction process. Submittal of the information shall be within 30 days of the submittal approval.
- E. Manufacturer's Requirements: Startup Procedures shall incorporate all manufacturer-specified procedures.
- F. Recording and Documentation of the Startup: Manufacturer's startup protocols shall be executed, and forms shall be completed by a qualified/authorized technician. These shall either be produced electronically or shall be scanned and submitted electronically.
- G. Owner Access: Contractor shall allow access by Owner's representatives to inspect the equipment and ensure its proper operation. Owner will be allowed to affix service tags to equipment to track the proper maintenance.

1.15 FUNCTIONAL PERFORMANCE TESTING

- A. The objective of Functional Performance Testing is to demonstrate that each system is operating according to the documented Owner's Project Requirements and Contract Documents. Functional Performance Testing facilitates bringing the systems from a state of Substantial Completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
- B. The logistics and procedures involved in Functional Performance Testing are outlined below and in Section 01 9115.

1.16 DEFICIENCIES IDENTIFIED DURING FUNCTIONAL TESTING

- A. Non-Conformance. Non-conformance deficiencies identified during Functional Performance Testing shall be resolved as follows:
 - 1. The CA will record the results of the functional test in CxWorx. All deficiencies or non-conformance issues shall be noted as Exception Records and reported to the Owner.
 - 2. Corrections of identified minor deficiencies may be made during the tests at the discretion of the CA. In such cases the deficiency and associated resolution will be documented in the database.
 - 3. Every effort will be made by the CA to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and a deficiency is identified, the CA will discuss the issue with the executing Contractor.
 - a) When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
 - 1) The CA shall document the deficiency along with the Contractor's response and intentions, and they go on to another test or sequence. A copy/email of the deficiency shall be generated and provided to the Contractor and CA. The Contractor corrects the deficiency, completes the Exception Record response

- certifying that the issue is resolved, and /or the equipment is ready to be retested, and sends it back to the CA.
- 2) The CA reschedules the test and the test is repeated.
- b) If there is a dispute about a deficiency, regarding whether it is a deficiency and/or who is responsible:
- 1) The deficiency shall be documented as an Exception Record with the Contractor's response and the CM will be notified. The CM will track this issue under the construction contract dispute resolution provisions.
 - 2) Final interpretive authority is with the A/E. Final acceptance authority is with the DM.
 - 3) The CA documents the resolution to the Exception Record.
 - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and responds to the Exception Record indicating completion. The CA reschedules the test and the test is repeated until satisfactory performance is achieved. CA then closes the Exception Record.
- B. Cost of Retesting: The cost for the CA to retest a Startup or Functional Performance Test shall be paid by the Contractor responsible for the deficiency. Owner shall pay the CA directly and back charge the responsible Contractor.
- C. Failure Due to Manufacturer's Defects. If 10% or three, whichever is greater, of identical pieces of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the DM. (For the purposes of defining 'identical equipment' for this Section, size or capacity alone does not constitute a difference.) In case of failure due to manufacturer's defects, the Contractor shall provide the Owner with the following:
1. Manufacturer's response in writing as to the cause of the failure and proposed resolution.
 2. Manufacturer shall implement their proposed resolution on a representative sample of the product.
 3. The DM will determine whether a replacement of all identical units or a repair is acceptable.
 4. Upon acceptance, the manufacturer shall replace or repair all identical items at their expense and shall extend the warranty accordingly (if the original equipment warranty had begun).
 5. Manufacturer shall pay the costs of all retesting necessitated by the failure.

1.17 TRAINING EVENTS

- A. General: Adequate and thorough training of the Operators and the facilities staff is vital to effective transition and early occupancy of the building. A key goal of the Cx Team is to ensure that this is accomplished. Contractors, Subcontractors, and Manufacturers/Vendors as specified shall prepare and conduct training sessions on the installed systems and equipment for which they are responsible. The Contractor shall be responsible for ensuring all other training is performed in accordance with the Contract Documents.
- B. Training Events Overview. Training Events include all classroom and field-based training sessions that result in the training or transference of Design Team or Contractor knowledge to the Owner. The following Training Events shall be executed as part of the Training Program:
1. Design Orientation Training: The CA and A/E shall be responsible for conducting a Design Orientation Training per the Cx Plan. This will be conducted by the Design Team after systems are placed but before Startup and shall be attended by the Contractor.
 2. Equipment and Systems Training: The Contractor (or Manufacturer's Representative) shall provide training to the Owner/Operators on individual systems and equipment only after

- successful Startup. These training events cover proper operation, maintenance, repair, and diagnosis of the systems, equipment, and components installed by the Contractor. Details are provided elsewhere in this Section.
3. Final Systems Operation Training: The Contractor shall provide training to the Owner/Operators on whole-building operation. This training shall focus primarily on BAS control of building systems and operation and its impact on building performance and shall be conducted after FPTs have been substantially completed.
- C. Training Means and Methods: Details on the means and methods for conducting training, including location requirements, preparation, methods for presentation, scheduling, instructor qualifications, and other details are provided in the specifications. Training sessions should typically start and end in a classroom setting. Field demonstrations will also typically be conducted to demonstrate the hands-on aspects of the required tasks.
- D. Training Plan Document
1. The Training Plan shall outline the Equipment and Systems Training and Final Systems Operation Training Events as proposed by the Contractor, and shall be approved by the CA. Contractor will compile the individual training agendas of the subcontractors and vendors and submit a comprehensive Training Plan to the CA, Architect and the Owner for review. Training Plan shall summarize all equipment and systems-related training events with topics to be covered and approximate training duration.
 2. The Training Plan shall include at a minimum:
 - a) Topic and applicable specification section;
 - b) Scheduled date(s) for the Events(s);
 - c) Location and setting (classroom or field);
 - d) Lead instructor and instructors' qualifications;
 - e) Co-instructors and their qualifications;
 - f) Training objective;
 - g) Event outline/agenda;
 - h) Detailed breakout of content to be presented;
 - i) Anticipated duration;
 - j) Required attendees for each session.
 3. Review: Contractor shall submit Training Plan to the CM, who will then disseminate it for review. Contractor shall incorporate comments and requirements resulting from the review and resubmit the Training Plan prior to conducting any training sessions.
- E. Training Prerequisites: Training shall not be conducted until the subject system or equipment is operating properly and after it has been successfully started per the commissioning requirements. If Contractor wishes to schedule both Startup and Training on the same day/visit, Contractor shall allow enough time to fully startup and document startup of the systems. If the systems are not fully functioning, training will be canceled and rescheduled.
- F. Record Training Documentation: The Contractor must document all training sessions. Beyond that included in the Training Plan, documentation shall include the names of the attendees. Training shall follow handouts that list at a minimum the key points in bullet-form presentation style, and presentation handouts shall be provided even when training follows detailed written documentation. Training will not be approved unless it contains accompanying written documentation.
- G. Equipment and Systems Training
1. Description: Training of Owner/Operators on individual systems and equipment shall be conducted by the Contractor or Manufacturer's Representative only after successful Startup has been completed. This training will typically occur over a period of time as

multiple events as systems and equipment are ready. This training shall cover proper operation, maintenance, repair, and diagnosis of the systems, equipment, and components installed by the Contractor. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. These sessions shall use the manufacturer's printed installation, operation and maintenance instruction material and shall include a review of these instructions emphasizing safe and proper operating requirements and preventative maintenance. The orientation and inspection function of the equipment in the system shall be discussed. Training shall follow handouts that list the key points in bullet form presentation-style or follow detailed written documentation. Training will not be approved unless it contains accompanying written documentation.

2. Equipment Covered: Training shall be provided for all major items of commissioning-related equipment and per the Specifications.
3. Minimum Training Content: Equipment and Systems Training shall include as a minimum for each type of equipment:
 - a) Presenting the equipment in the context of this facility. Typically, the responsible subcontractor will provide this introduction to the session. The trainer shall review how the equipment serves this specific facility. Information shall include equipment amounts, numbers, capacities, sizes and locations and shall show the equipment in applicable system schematics.
 - b) Conceptual overview of how the equipment works;
 - c) Names, addresses, phone numbers, websites of sources for information, tools, spare parts, and other details for the equipment;
 - d) Details of the warranty or guarantee;
 - e) Intended sequences of operation in all modes of operation;
 - f) Limits of responsibility (example: unit-mounted controls vs. BAS);
 - g) Sources of utility support;
 - h) Routine operator tasks involving monitoring and operation, covering all modes of operation and mode switching as applicable;
 - i) Relevant health and safety practices/concerns;
 - j) Common problems and their diagnosis and repair;
 - k) Proper maintenance schedules, tasks and procedures with demonstrations;
 - l) Emergency response, documentation and recovery procedures.
4. Scheduling: These events shall be coordinated through and scheduled by the CA.
5. Attendees: Contractor shall insure that all appropriate subcontractors be present for these sessions. Any Cx Team member is eligible to attend. Required attendees include the applicable Contractors (Lead), CA, and the Owner/Operator.

H. Final Systems Operation Training

1. Description: Final Systems Operation Training provides the Owner and Operators a training session on whole-building operation. It shall focus primarily on BAS control of building systems and operation and its impact on building performance. System interactions shall be presented and discussed (such as a combined air handler, chiller, boiler, and terminal unit system), along with a detailed presentation of the sequences of operation and their relationship to the BAS. This training shall be conducted by the BAC with assistance from the CA, and shall be attended by the Owner, Operators, Contractor, Design Team, and by any other Commissioning Team members deemed necessary by the CA or the Owner.
2. Coordination with BAS Training: Detailed BAS component training for the facility Operators shall be considered as part of Equipment and Systems Training. This training shall have been completed prior to Final Systems Operation Training.
3. Scheduling: Final Systems Operation Training shall be conducted after all FPTs have been successfully executed.

4. Attendees: Any Cx Team member is eligible to attend. Required attendees include the BAC (lead), CA (assist), CM, MC, MDE, and Owner/Operators.

1.18 SYSTEMS MANUAL PREPARATION AND LOGISTICS

- A. CA shall assemble a complete Systems Manual providing essential facility information. In hardcopy format, the Systems Manual will typically consist of multiple individual binders. Contractors and their subcontractors shall provide all the content applicable to their Division of work in the format specified by the CA. The content and organization of the Systems Manual shall be as indicated below. The Systems Manual shall be provided in hard copy and electronic (pdf) format.
- B. The Systems Manual shall provide the information needed to understand, operate, and maintain the facility and its systems. It should be the repository of all updates and corrections as they occur (even through occupancy). The Systems Manual expands the scope of standard O&M documentation to incorporate additional information developed through the commissioning process. The Systems Manual includes but is not limited to the standard Contractor-developed materials related to O&M and training, as well as the Design Team-developed Owner's Project Requirements, Basis of Design document, and certain design drawings.
- C. Contractor, Subcontractors and Vendors/Factory Representatives shall prepare, organize and submit applicable content for the comprehensive and coordinated Systems Manual as specified below. Content for one system and all associated equipment must be organized and made in one submission. However, systems may be submitted separately based on the progress of the project. Each submission shall be indexed as a sub-entity to the overall Systems Manual submission.
- D. Requirements as specified include requiring the applicable Contractors to author project-specific information in a consistent format in addition to submission of standard pre-printed manufacturer's O&M and product information. The content provided by all Divisions will be incorporated by the CA into a single comprehensive Systems Manual.
- E. Maintenance of the applicable Systems Manual information throughout the Warranty Period shall include:
 1. Changing any indicated settings, parameters, and other operational parameters that were changed by the Contractor during the Warranty Phase.
 2. Changing any instructions as to procedures that needed to be changed during the Warranty Phase.
 3. Changing the record Schedules and/or Sequences of Operation if they were changed during the Warranty Phase.
 4. Updating any Operation and Maintenance instructions if they were changed or updated by the manufacturer.

1.19 SYSTEMS MANUAL CONTENT AND ORGANIZATION

The Systems Manual format and content requirements shall be as follows. The Party responsible for each topic shall assemble, author, develop, coordinate, or otherwise produce the content for that topic and provide to the CA.

- A. Manual Section 1 - Facility Information
 1. Directory of Entire Manual: Provide a directory indexing the entire set of manuals that comprise the Systems Manual.

2. Owner's Project Requirements (OPR): [A/E] Describe the function of the facility. Detail the overall dimensions of the facility, number of floors, foundations type, expected number of occupants, and facility category code. List and describe all the facility systems listed in Part II - Primary Systems Information and any special building features (for example, cranes, elevators, and generators).
3. Basis of Design (BoD): [A/E] The BoD illustrates the means by which OPR criteria are to be achieved, documenting the assumptions and parameters used in the design, and documenting the primary thought processes or decisions made that resulted in the selected alternatives.
4. Utility Connection and Cutoff Plans: A/E to provide utility site and floor plans that indicate the exterior and main interior connection and cutoff points for all utilities. Include enough information to enable someone unfamiliar with the facility to quickly locate the connection and cutoff points. Do not include items such as contour lines, elevations, and subsurface information on the site plans. Indicate the room number, panel number, circuit breaker, valve number, etc., of each connection and cutoff point, and what that connection or cutoff point controls. These plans are in addition to the floor plans.

B. Manual Section 2 - Primary Systems Operating Information

This Part shall be organized by Division then system/subsystem using a systems approach. Part 2 contains system information, whereas Part 3 contains equipment information.

1. System Description [A/E]: Provide a detailed discussion of the system composition and operation. Include technical details that are essential for an understanding of the system. A/E shall provide narratives to the CM who shall provide these to the major subcontractors for use in the systems description. Also cross-reference O&M data contained in Part 4 and product data and submittals contained in Part 4.
2. System Flow Diagrams [A/E]: Provide a flow diagram indicating system liquid, air (do not include ductwork) or gas flow during normal operations. Integrate all system components into the diagram.
3. Startup and Shutdown Procedures [CM]: Provide step-by-step instructions to bring systems from static to operational configurations and from operating to shutdown status. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project.
4. Normal Operating Instructions [CM]: Provide a discussion of the normal operation and control of the system. Address operating norms (for example, temperatures, pressures and flow rates) expected at each zone or phase of the system. Supplement the discussion with control and wiring diagrams and data. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project.
5. Emergency Operating Instructions [CM]: Provide emergency operating procedures in the event of equipment malfunctions. Provide shutdown instructions for fires, explosions, spills, or other contingencies. Installing Contractor or Vendor/Manufacturer shall author this specifically for this project. This content shall be in the context of the systems themselves and support the Emergency Operations manual to be created by the Owner.
6. Environmental Considerations [CM]: Provide a listing of the equipment that requires special operation, reporting, testing, analysis or inspection to comply with federal, state or local environmental laws. Examples of possible list items include back flow preventer inspections, underground storage tank testing, hazardous material or waste usage/storage documentation and air pollution control devices. For each item, include requirements for environmental operation, reporting, testing, analysis and inspection as well as references to respective implementing regulations, statutes or policies.
7. Sequence of Operation/Control Schematic [A/E]: Provide the written sequence of operation for the applicable system and the control schematic diagram.
8. Maintenance Service Agreements [CM]: Provide copies of maintenance service agreements where there pertain to systems involving multiple components and devices as indexed in Part 3.

9. Balancing Reports [CM]: Insert the Balancing Reports provided under Section 23 05 93 for the subject system.

C. Manual Section 3 - Maintenance Manual

Organize this section by first discipline then by equipment number or ID.

1. Maintenance Index [CM]: Provide a summary table that indexes the equipment requiring maintenance and indicates the frequency each piece of equipment needs attention, and a reference to the number of the Procedure associated with that frequency. CM will provide Contractors with an Excel spreadsheet that will be completed by each applicable subcontractor and returned to the CM for incorporation in the Maintenance Manual.
2. Maintenance Information [CM]: Maintenance Information for each indexed entry shall contain the following:
 - a) Equipment Data Sheet: Provide a summary of key nameplate and performance data.
 - b) Procedures: Provide a 'Task Card' or step-by-step procedures for each individual maintenance procedure for a given frequency identified on the Maintenance Index. Include detailed PM procedures, safety instructions and precautions including Lock Out/Tag Out precautions, required skill level, number of personnel needed, frequency, special tools needed, parts needed, and estimated time required to complete the task. These procedures shall be indexed in a manner approved by the Owner. These shall be provided as Microsoft Word files or scanned documents from the manufacturer's O&M Manual in either (pdf, tif, jpg or bmp formats)
 - c) Equipment and Systems Training Documentation: Include agenda, all handouts (exclusive of O&M documentation that is included below) and presentation materials/content. Reference existence and index of DVD or video tape recording.
 - d) Field Test Reports: Provide Field Test Reports that apply to equipment associated with the system.
 - e) Troubleshooting Instructions: Provide detailed trouble-shooting procedures indexed by common/expected symptoms. Alternatively, make specific reference to page in the manufacturer's O&M Manual where this information is provided.
 - f) Extended Warranty Information: Include all warranties for products, equipment, components, and sub-components whose duration exceeds one year. Include warranties on components with the system they are a part of. Reference all specific operation and maintenance procedures that must be performed to keep the warranty valid.
 - g) Special Tools: Provide a listing of any special tools required for servicing, diagnosis, or repair. Alternatively, reference specific page in the manufacturer's O&M Manual where this information is provided.
 - h) Supply Inventory Requirements: Provide a list of maintenance and repair supplies (e.g., spare parts, fuels and lubricants) required to ensure continued operation without unreasonable delays. Identify and list parts and supplies that have long purchase lead times. Alternatively, reference specific page in manufacturer's O&M Manual that contains this information.
 - i) Sources of Spare Parts: Include reference to contact information where spare parts can be obtained.
 - j) Lubrication Schedule: Provide a lubrication schedule indicating types, grades, and capacities of lubricants for specific temperature ranges and applications. Alternatively reference the specific page in the manual that contains this information
 - k) Maintenance Service Agreements: Provide copies of maintenance service agreements where they pertain specifically to indexed equipment.
 - l) Manufacturer's O&M Manual: Include manufacturer's printed O&M information. These shall be provided in pdf format. If unavailable as pdf from the manufacturer, hardcopy manual shall be scanned and provided as a single file.

D. Manual Section 4 – Ongoing Commissioning Plan

1. Define the Ongoing Commissioning Process [CA]: Provide a detailed description of the ongoing commissioning process specific to the project.
2. Define Roles and Responsibilities [CA]: Provide a detailed description of the roles and responsibilities of the commissioning team and owner in the successful completion of ongoing commissioning.
3. Provide recommend schedule for recommissioning as-built systems [CA].
4. Provide documentation that will allow for and encourage updating of the building operating plan and current facility requirements throughout the building's lifetime [CA].
4. Provide blank testing materials [CA]
 - a) Provide blank functional performance test scripts
 - b) Provide blank issues log
5. Provide direction for testing any new and retrofitted equipment [Owner]

1.20 TEMPORARY CONDITIONING

- A. Contractor shall only use building permanent equipment to provide temporary conditioning with the prior approval of Owner. Approval for such use will only be given upon acceptance of a detailed plan provided by the individually involved subcontractors and compiled by the CM. The temporary conditioning plan shall consider/address the following at a minimum.
1. Indicate that the full startup protocol as required by the specification for final acceptance will be performed for the temporary startup. Temporary conditioning plan shall include the startup forms to be used which will be the same as those that will be used for final startup.
 2. Contractor shall address how equipment will be maintained in good, clean condition. Specifically address:
 - a) Temporary filtering of air: Air Filters used for construction shall be at least that specified for final use. Contractor shall remove construction filters and replace with new filters at substantial completion. Filters shall be maintained and replaced at the specified final pressure drop. Contractor shall install a magnahelic for visual indication of pressure drop as well as set up the loaded filter DP switch for monitoring on the BAS.
 - b) Temporary Filtering of Water and Condensate: Construction strainers shall be used while circulating fluid during construction. Strainer shall be finer than specified for final strainers.
 - c) Sealing/Filtering of Open Ducts: Address that all open ducts shall be either sealed or protected with filter media. Return or exhaust systems shall not be used during construction unless otherwise approved.
 - d) Lubrication and Maintenance: Contractor shall maintain the systems and equipment in accordance with the manufacturer's instructions. Contractor shall coordinate lubricants used with Owner's operators. Frequency of lubrication and inspection shall be as recommended by manufacturer's literature. Applicable maintenance lubrication schedules shall be included in the plan. Draft maintenance logs shall be submitted with plan and completed as maintenance is performed.
 - e) Operation outside of Normal ranges: Systems and equipment shall not be operated outside the range of specified conditions. Plan shall address how the contractor will ensure that operation will not harm the equipment
 - f) Emergency Condition Identification and Response protocols: Plan shall address protocols for responding to equipment malfunctions and or harmful operation. Automatic safeties and remote enunciation shall be in place to protect people and property. Temporary operation shall not be allowed until there is an automatic communication/enunciation medium such as a phone connection or an internet connection. At a minimum, an alarm on the equipment used for temporary service

shall be automatically sent to the contractor's 24-hour monitoring service and to the Owner's help desk. The contractor shall respond to and be responsible for securing conditions within the building. Owner shall assess the situation and as necessary secure utilities feeding the building from isolation points outside of the building.

3. Building Protection: Address how the system will be controlled to avoid humidity conditions that will either promote mold growth or cause corrosion.
4. Equipment Reconditioning: Address with specific means and methods how the equipment used for temporary conditioning will be re-conditioned to new condition. Belts, seals, bearings, couplings, or other parts that wear more than 3% of their expected life shall be replaced.
5. Cleaning: Address how ducts, pipes, coils, converters, air handling equipment, terminal units, etc. shall be cleaned at final turn over.
6. Operations Log: Contractor responsible for operating the equipment shall maintain a log of all activities associated with operating and maintaining equipment. Log shall be submitted to Owner on a frequency specified by them.
7. Operating System Alterations: Plan shall address specific protocol for doing work the systems
8. Any material, device, component, equipment, etc. that is assessed as damaged or as having a substantially shortened life as a result of temporary conditioning operation shall be replaced by the contractor at no cost to the contract.
9. Segregation: Where only portions of a system are to be used, contractor shall specifically indicate how the used portion will be isolated from the unused portion. Plan shall address how to ensure that the reduced operation condition will be maintained within acceptable ranges, and/or how capacity will be throttled to keep all operating parameters in recommended ranges.

1.21 PHASING PLAN

- A. If contractor intends to start, run, or occupy portions of systems in phases, contractor shall submit a plan for phasing in areas/portions of systems that will be connected subsequent to the initial portions. Specifically address:
 1. Pipe and Duct Cleaning: indicate the configurations and protocols for isolating subsequent regions and then protecting the preceding regions when the subsequent region is cleaned/flushed and connected.
 2. Pipe disinfection: Indicate the plan for disinfecting each region of potable water or medical gas pipe that requires disinfection. Indicate how the preceding regions of the system will be protected when connecting subsequent regions.
 3. Piping Certification/Testing: Indicate the plan for certifying each region of pipe that requires certification and or testing such as laboratory gases, medical gases, and RO/DI water (testing for water quality). Indicate how the preceding regions of the system will be protected when connecting subsequent regions. Indicate how you will verify that the certification/test results on the previous systems have not been invalidated.
 4. System Modifications: Indicate the protocols for making subsequent changes to the systems of pipe and duct when the systems have already been cleaned, flushed, pressure tested, disinfected, certified, etc.

PART 2 PRODUCTS

2.01 INSTRUMENTATION

- A. General: All testing equipment used in the commissioning process shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.
- B. Standard Testing Instrumentation: Standard testing instrumentation normally used for performance assessment and diagnosis will be provided by the CA. Refer to Sections 23 0800 for a list of applicable test equipment.
- C. Special Tools: Special equipment, tools and instruments (only available from a vendor, and specific to a piece of equipment) that are required for testing equipment in accordance with the Contract Documents shall be included in the base bid price to the Contractor and left on site for the Owner.

2.02 TEST KITS FOR METERS AND GAGES

- A. Test kits for meters and gages shall be provided to the Owner new and in good condition. Previously used test kits will be unacceptable. Kits shall be submitted prior to the Acceptance Phase. Kits required are specified in the individual technical specifications and in 23 0800.

PART 3 EXECUTION

3.01 Functional performance Test Execution

- A. Functional Performance Testing procedures are specified in Section 01 9115. Contractor shall participate in the development of the testing procedures as needed.

END OF SECTION

SECTION 01 9115 FUNCTIONAL PERFORMANCE TESTING PROCEDURES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Functional Performance Testing of systems.
- B. Documentation of FPTs.
- C. Acceptance criteria.

1.2 SCOPE

- A. This section describes the Functional Performance Testing (FPT) process, procedures, and requirements. It is intended to illustrate (i) the Contractor's requirements for assisting the Commissioning Authority (Commissioning Authority) with the functional performance testing of systems, and (ii) to demonstrate the level at which systems and equipment will be tested prior to being deemed 'Acceptable' to the Owner.
- B. The Commissioning Authority will prepare itemized and detailed testing plans and procedures that:
 - 1. Specify individual tests and procedures that meet the requirements of the Commissioning Plan and commissioning process;
 - 2. Serve to document and record the testing procedures and the results of the tests.
- C. The Contractor shall provide technical input to the Commissioning Authority as needed during the development of the final project FPTs.
- D. Example FPTs are provided as illustration to the Contractor of the level of detail to which FPTs will be conducted.

1.3 Related Work and Documents

- A. Commissioning Plan: The Cx Plan is part of the Contract Documents and outlines many of responsibilities, procedures and tasks throughout the commissioning process. It encompasses the entire commissioning process including phases prior to construction and roles of all commissioning team members. It also describes the Functional Performance Tests that will be performed during the Acceptance Phase.
- B. Section 01 9113: Specifies the general facility commissioning procedures common across all Divisions and the Contractor's responsibilities for the commissioning process.
- C. Section 23 0859 – Building Automation Systems Commissioning: Details the commissioning procedures specific to the Building Automation System.
- D. Section 23 0800 – Mechanical Systems Commissioning: Details the commissioning procedures specific to Division 23 work.

- E. Individual Specification Sections: Individual sections stipulate installation, start-up, warranty, O&M documentation, and training requirements for the system or device specified in the Section.

1.4 Definitions and Abbreviations

- A. Refer to Section 01 9113.

1.5 Functional Performance Testing

- A. Objectives and Scope: Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response in the sequence of operations. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested
 1. Normal Operation: Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response in the sequence of operations. These series of tests will demonstrate that the systems and equipment operate throughout typical operation including normal adjusting, cleaning, media replacement, and maintenance.
 2. Abnormal Operation: Test each system to simulate possible abnormal conditions and verify proper responses to such modes and conditions as power failure, equipment and component failure, freeze condition, deviation of operating parameters outside of normal, no flow, supporting utility failure, human error, etc. This series of tests shall demonstrate proper and safe response to the tested systems and the other systems that it affects or with which it integrates. These tests shall also demonstrate proper alarming of abnormal conditions to quickly and effectively notify users and operators of such condition. Specific modes required in this project are given in this section and any other sections where test requirements are found.
- B. Development of Test Procedures. The Commissioning Authority shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the Commissioning Authority shall provide a copy of the test procedures to the Contractor who shall review the tests for feasibility, safety, equipment and warranty protection, and scope. The Commissioning Authority will also submit the tests to the A/E for review.
 1. Contractor shall review the FPTs in detail and approve them.
 2. The Commissioning Authority shall review Owner-contracted testing, factory testing, or required Owner acceptance tests for which the Commissioning Authority is not responsible to oversee. Review shall include content, scope, and documentation format, and shall determine what further testing or format changes may be required. Redundancy of testing shall be minimized.
 3. The purpose of any given specific FPT is to verify and document compliance with the stated criteria of acceptance.
- C. Scheduling: After Contractor's notification that systems are ready for functional testing and review of all the required submittals has occurred, the Construction Manager shall schedule the testing. To the extent practical, tests shall be scheduled to allow efficient and contiguous testing of inter-related systems and equipment.

- D. Participation: The Commissioning Authority will direct and conduct functional performance tests after Start-Up Procedure and Pre-Functional Checklist documentation of systems and equipment have been reviewed and accepted. Conceptual procedures for the functional performance testing are outlined elsewhere in this Section. The Commissioning Authority will execute the FPTs unless otherwise specified. The Contractor shall assist as described above with manipulation of the systems or equipment, provision of supporting equipment or materials (lifts, ladders, specialty test equipment, safety equipment), and on-the-spot remediation of minor identified deficiencies whenever possible. Required participation is outlined in the generic FPTs provided elsewhere in this Section.
1. Required participating Parties shall be indicated with the individual FPT. Typically, multiple Parties are required for any given test, yet participation for any given Party is only required for the respective portion of the test for which the Party is responsible.
 2. On multiple samples where a given Party does not directly conduct the test, the participation of that Party will only be required for an initial quantity of systems/equipment. Whenever practical and at the discretion of the Commissioning Authority, the Commissioning Authority will continue with the remaining portion of the sample without assistance from the Contractor. The Contractor is allowed to be present at their option for any or all FPTs conducted.
 3. It is required that the required Parties be available on-site throughout the testing of any given system for which they are required participants. Therefore, time for which they are not directly involved can be spent performing other work (typically addressing identified punch list items or failed tests).
 4. No Party involved with the project is prohibited from participation in or witnessing of any tests. Any Contractor may elect to witness all tests on their systems even if their involvement is not directly.
 5. The Commissioning Authority will endeavor to coordinate effectively with the individual Contractors throughout FPTs and minimize their required involvement.
 6. Contractor assumes responsibility for damage to systems conducted in accordance with the approved procedures.
- E. Detailed Test Procedures and Contractor Review: The Commissioning Authority will prepare detailed and itemized testing procedures to define and document the FPTs. These will be developed during the Construction Phase and completed during the Acceptance Phase. The Commissioning Authority shall submit these procedures to the Contractor for review. Contractor shall indicate all required limitations, safety procedures, maximum thresholds, and any other parameters during the FPT development. Contractor shall be responsible for any damage to the equipment caused by functional performance testing done per the procedures and within the limitations of the approved procedures.
- F. Completeness: All systems must be completed and ready for FPT. All start up, factory authorized field testing, independent testing agency tests, and TAB procedures must be complete, and the control systems must be tested and started for the respective system or component.
- G. Test Documentation: Commissioning Authority will conduct tests, and/or witness tests as applicable. Commissioning Authority will record all test results on the forms developed for the testing. Commissioning Authority will 'Pass' or 'Fail' the testing and record the date and time of the test. Deficiencies shall clearly be indicated when the test is failed. When all related testing is completed successfully, Commissioning Authority shall recommend acceptance of the system or component.

- H. Deficiencies and Re-Testing: When deficiencies are identified during testing, depending on their extent or magnitude, they can be corrected during the test and the testing can continue to successful completion. More significant deficiencies will require failure of the test and re-testing. Deficiencies of this magnitude will result in an Action Item on the Action List. The resolution of the deficiency will then subsequently be tracked by the Commissioning Authority via the Action List. All tests shall be repeated until successful completion. Refer to more specific provisions below.
- I. Sampling: Some types of identical equipment (such as terminal devices) will be tested using a sampling strategy. The sample percentage is indicated in the Commissioning Plan.
- J. Max Failure Limit and Sample Percentages: A Maximum Failure Limit is indicated along with the Sampling Percentages. The Max Failure Limit indicates the maximum percentage of the tested devices that may have any test that fails before an entirely new sample must be tested. This is based on the concept that if many failures occur, it is a result of inadequate start-up by the Contractor. When the maximum number of failures is reached, testing on that sample will be terminated and re-testing will be scheduled.
 - 1. If no Max Failure Limit is indicated, all tested samples must pass (Max Failure Limit 0%).
 - 2. Where sample tests involve multiple systems (i.e., checking strainers on different hydronic systems) the Maximum Failure Limit will apply per system.
 - 3. The responsible Contractors shall pay the Commissioning Authority cost of that sample test and redo the start-up/TAB for the applicable devices/systems.
 - 4. All work necessitated by sample failures shall be at no cost to the Owner.
- K. Opposite Season Testing: Testing procedures shall be repeated and/or conducted as necessary during appropriate seasons. Opposite Season testing will be required where scheduling prohibits thorough testing in all modes of operation. Air handler and central heating system testing for heating-related modes of operation and control loops shall be tested during outside air temperatures below 35°F.
- L. Approval: The Commissioning Authority passes each test and subsequently recommends acceptance to Owner or Construction Manager who reviews and accepts the results of the FPT.

1.6 Coordination Between Testing Parties.

- A. Factory Start-Ups: For many systems and equipment, Factory Start-Ups are specified. These Factory Start-Ups will be reviewed and checked during functional performance testing. All costs associated with the Factory Start-Ups are included with the bid unless otherwise noted. In general, Contractor shall make notification of when Factory Start-Ups are occurring and coordinate these with witnessing Parties. The Commissioning Authority and commissioning team members may witness Factory Start-Ups at their discretion. Aspects of functional performance testing accomplished during the Factory Start-Ups may be accomplished and approved by the Commissioning Authority if they meet the intent of the FPT.
- B. Independent Testing Agencies: For systems where Independent Testing Agencies are specified, the cost of this testing is included with the bid unless otherwise noted. Much of the testing performed by these independent agencies will cover aspects required in the Start-Up Procedures and functional performance tests.

1. Contractor and testing agencies shall coordinate with the Commissioning Authority so that the Commissioning Authority can witness the testing and approve the applicable aspects of the FPTs.
 2. The Commissioning Authority may in some cases independently spot-check work of the testing agencies if the tests were not witnessed. However, it is not the intent for the Commissioning Authority to re-accomplish testing by others that is specified in the construction specifications.
 3. Contractor is responsible for coordinating the efforts of testing agency with that of the commissioning process. Documentation shall be contiguous and seamless, and duplication should be avoided. Testing agencies shall complete the documentation of the commissioning process as required.
- C. Specialized Testing by Contractor: Where specialized testing is specified in the technical specifications, Contractor, subcontractor, vendor, or factory representative as applicable shall conduct the specified testing and provide all specialized instrumentation and equipment. Commissioning Authority and other commissioning team members may witness tests at their discretion. The Commissioning Authority may in some cases independently spot-check the results of the tests if the tests were not witnessed. However, it is not the intent for the Commissioning Authority to re-accomplish testing that is specified in the construction specifications. All specialized testing procedures shall be integrated with the Cx process and all documentation shall be coordinated and integrated with the documentation of the Cx process. Examples of specialized testing include:
1. Generator load testing (not building power outage functional testing which will be administered by Commissioning Authority)
 2. Acceptance testing of the Fire Alarm System
 3. Fire suppression system hydraulic tests
 4. Laboratory Gas Cross Connection testing
 5. Uninterruptible Power Supply
 6. Fume Hood Acceptance Testing
 7. Electrical System Testing per NETA
 8. Room Leakage Testing
 9. Room Pressure Decay Testing

1.7 FUNCTIONAL PERFORMANCE TEST ACCEPTANCE CRITERIA

- A. The Acceptance Criteria shall be as follows unless more specifically indicated within individual tests. Commissioning Authority may exercise professional judgment to relax requirements and pass tests and recommend approval when appropriate.
1. Capacity and/or equipment performance will generally be as specified $\pm 5\%$.
 2. Efficiency where specifically indicated in the documents will be $\pm 5\%$. When inferred from manufacturer's catalogue data, criteria will be $\pm 10\%$.
 3. Balancing-related criteria will be $\pm 5\%$ for water and $\pm 10\%$ for air.
 4. Accuracy/repeatability on sensing devices will be as specified for the device. Commissioning Authority and TAB will use calibrated gages for independent validation and use judgment in passing or failing the devices. In many cases, the coordination of multiple related sensors is more important than absolute accuracy.
 5. Loop response and set point deviation criteria will be as specified in Section 23 0859.
 6. HVAC sequence-related criteria will be as explicitly specified in the documents and as interpreted by the Commissioning Authority. Code required sequencing shall be per the applicable code.

7. System sequences shall be as required by the approved shop drawings.
8. Motor Phase Imbalance: Shall be no more than 2% (Amps and Volts).
9. Noise Levels:
 - a) Occupied spaces: As indicated in the Basis of Design document. Otherwise, noise level shall be as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
 - b) At limits of the enterprise or facility: As required by current local ordinances.
10. Indoor Environmental Parameters (T, RH, CO₂, VOC): Shall be as indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
11. Air Pressurization: As indicated in the Basis of Design document. Otherwise, as indicated in the most current version of the ASHRAE Handbooks for the applicable occupancy. Smoke/shaft pressurization shall be as required by NFPA to maintain maximum door opening forces and to restrict the passage of smoke.
12. Indoor Lighting Levels: As indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the IES Handbooks for the applicable occupancy.
13. Electrical Systems: Shall be in accordance with manufacturer's recommendations of individual components and devices, NFPA 70B and International Electrical Testing Association (NETA) testing specifications NETA ATS-Latest Version.
14. Inter-system interfaces and coordination: as specified and generally to ensure safe, reliable, and robust operation.

PART 2 PRODUCTS

2.1 INSTRUMENTATION

- A. General: All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available. Supplier of instrumentation shall submit the calibration certificates along with the startup documentation.
- B. Standard Testing Instrumentation: Standard instrumentation normally used for performance assessment and diagnosis will be provided by the Commissioning Authority for tests being conducted by Commissioning Authority. All other instrumentation shall be provided by the Contractor. The instrumentation to be provided by the Commissioning Authority includes:
 1. Electronic Manometer (for Air and Flow Hood)
 2. Electronic Manometer (for Water)
 3. Temperature Instruments and Gages
 4. Humidity Instrument and Gage
 5. Sound Meter
 6. Light Level Meter
 7. Electronic Multimeter
 8. Receptacle Tester

- C. Special Tools: Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and provided to the Owner.

PART 3 FUNCTIONAL PERFORMANCE TESTS (SYSTEMS AND EQUIPMENT RELATED)

3.1 PREREQUISITES

- A. All equipment, components, and devices applicable to the FPT must be started and the Start-Up must be documented and passed. This includes completion of Pre-Functional Checklists, Start-Up Procedures, pressure testing of equipment, duct, piping; flushing/cleaning of applicable systems; completed labeling and identification; completed insulation of applicable systems; and all other requirements for placing system into dynamic operation.
- B. Unless specifically agreed to by the Owner and Commissioning Authority, all support systems shall be complete prior to FPT. These support systems may include, but not be limited to the following:
 - 1. The electrical system serving the equipment is completed and tested;
 - 2. The hydronic systems serving the equipment have been pressure tested, flushed, and functional performance tested;
 - 3. Balancing has been accomplished on the air and water sides;
 - 4. The control systems have been started up and calibrated.
- C. The Commissioning Authority shall determine the optimal sequence of testing.

3.2 FUNCTIONAL TESTING PROCESS

- A. Functional Testing on any given system shall begin with testing sensing elements such as temperature, pressure and status. The next level will be major components of a system such as valves, dampers and pumps. The next level will be the system with all applicable modes and failure scenarios. The final level will be an integrated test of building performance.
- B. Functional Testing of systems will proceed from the main central systems such as chiller and boilers, to the distribution systems such as secondary pumping and air handling units, to the zone terminal units. Commissioning Authority shall plan this process with the Construction Manager. Construction Manager shall reflect that process in the Construction Schedule. Subcontractors shall perform work in accordance with the schedule.

3.3 COMMON ELEMENTS FOR ALL SYSTEMS

- A. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements.

- B. Contractor shall provide the completed Start-Up Procedures prior to the time of testing. Commissioning Authority shall review the Start-Up Procedure documentation and spot-check prior to the beginning of FPT.
- C. Contractor shall demonstrate that access is sufficient to perform required maintenance.
- D. BAS trends shall have been established as required in the documents. These shall be reviewed prior to or during FPT.
- E. All dynamic systems powered by electricity shall be tested to simulate a power outage to ensure proper sequencing. Those on emergency power or uninterruptible power shall be tested on all sources.
- F. Capacities and adjusted/balanced conditions as applicable shall be subject to verification.
- G. All modes of operation and actions shall be verified for equipment/system samples to verify sequencing.
- H. System and equipment configurations shall be compared against the contract documents.
- I. Verify functions (such as heating and cooling) are coordinated and do not overlap.
- J. All systems adjusted and balanced by the TAB contractor and controlled by the BAS shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to establish reliable, efficient, safe and stable operation.
- K. The graphic displays for all components, systems, and areas required to be represented by a graphic shall be checked for adequacy and accuracy. When set points or other parameters are required to be adjustable, Commissioning Authority shall verify that they can be adjusted directly from the graphic screen.
- L. Emergency power tests for mechanical systems will be conducted in concert with the testing of the emergency power systems. Mechanical contractor shall be available for the power outage test to test mechanical systems under a power outage. This is in addition to the requirements specified for the mechanical system.
- M. Where system and zones are designed for various modes of operations and are indicated as such, test representative systems in all modes of operation. This includes, but is not limited to the following modes:
 - 1. Seasonal Modes
 - 2. Sequencing Modes
 - 3. Emergency Modes

3.4 TAB VERIFICATION OF MECHANICAL SYSTEMS

- A. Commissioning Authority shall review TAB reports.
- B. Participants shall include: Commissioning Authority, Owner's Representative, and TAB.
- C. The Commissioning Authority will select up to 10% of the readings from the Balancing Reports and spot-check them. The maximum failure rate for this sample is 10% and the system shall be

re-balanced and re-documented if this rate is exceeded. The readings selected by the Commissioning Authority may include supply air diffuser readings (both minimum and maximum readings for VAV boxes), main and branch supply duct traverse readings, outside/return air flow readings, exhaust air flow readings, water flow readings, amp readings, and water pressure drop readings through coils, heat exchangers, and other hydronic elements. For all readings a deviation of more than what is allowed in the TAB specification 23 05 93 between the verification reading and reported data shall be considered as failing the FPT. All readings that fail the FPT shall require re-balancing.

3.5 VARIABLE SPEED DRIVES

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, BAS, and Electrical Contractor. Additional time is generally included with the systems that include the drives.
- B. Commissioning Authority shall review Start-Up Procedure.
- C. Verify the overload protection.
- D. Test the operation of the controller local and remote start/stop and speed control. Spot-check insulation resistance on the controller bus and control circuits.
- E. Validate setup parameters are coordinated with motor application.
- F. Validate Acceleration and Deceleration Rates on start and stop.
- G. Verify ranging of control input and coordination with that displayed on Operator Interfaces.
- H. Verify 'Bypass' functionality where applicable
- I. Verify restart after power outage.
- J. Verify any Skip Frequencies.
- K. Verify alarming and shutdown sequences.
- L. Conduct insulation resistance, short circuit, and ground tests of motors.

3.6 AIR HANDLING UNITS AND ROOFTOP UNITS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan and open/close of outdoor air damper.
- E. Start heating and cooling systems; manipulate control device to obtain maximum cooling and heating. Measure temperatures and pressures to determine capacity.

- F. Weather permitting, cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- G. Check calibration of control devices and for stable control response and component performance including chilled water coils, hot water coils, economizer cycles, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- H. Verify operation of the enthalpy wheels (AHU only)
 - 1. Inspect the installation visually for proper rotation and seal and undamaged media.
 - 2. Check cross contamination and re-entrainment testing results are done under the applicable section.
 - 3. Check the full sensible and latent recovery efficiency at peak summer conditions.
 - 4. With different weather conditions, check the mode of control. In winter, check the discharge loop control and make sure sensors are calibrated and that heating does not overshoot and require cooling. In mild conditions, ensure minimum rotation/recovery. In summer conditions, ensure maximum recovery.
 - 5. Check the frost protection override control loop.
 - 6. Test operation during power outage in the context of the associated air handler.
- I. Check for free and adequate flow of condensate.
- J. For variable speed fans, manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions. Manually ramp fan speed from minimum to maximum to ensure stable operation of fans. Record representative part load output from the drive. Check calibration of control input. Check drive bypass operation if applicable.
- K. Ensure minimum required ventilation rates are maintained across the full range of control (where applicable).
- L. Test all interfaces with the fire alarm system and all smoke control sequences.
- M. Verify interlocks with exhaust fans where applicable.
- N. Test proof alarming where applicable.
- O. Test operation of applicable safeties including freezestats, high and low static devices, smoke detection, duct humidity, and others. Check AHU component status in each event.
- P. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
- Q. Test all Fireman Control and Override sequences.
- R. Simulate power outage and ensure automatic and orderly restart.

3.7 EXHAUST AND SUPPLY FANS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.

- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Check the capacity of the fan at maximum conditions.
- F. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- G. Verify interlocks with AHUs and RTUs where applicable.
- H. Test all interfaces with the fire alarm system and all smoke control sequences.
- I. Test proof alarming where applicable.
- J. Simulate failures of fans and ensure proper start-up of backup fans.
- K. Test operation of applicable safeties including high and low static devices, smoke detection, and others.
- L. Simulate power outage and ensure automatic and orderly restart.

3.8 DUCTLESS SPLIT SYSTEMS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode. Minimum modes shall include:
 - 1. Full Cooling
 - 2. Full Heating
- F. Check proper operation and charge of refrigerant circuit.
- G. Confirm compressor cycling is within allowable frequency
- H. Confirm refrigerant piping is installed for adequate oil return
- I. Check calibration of control devices and for stable control response and component performance including chilled water coils, electric reheat coils, humidifiers, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- J. Check for free and adequate flow of condensate.

- K. Check for adequate air distribution.
- L. Test all interfaces with the fire alarm system and all smoke control sequences.
- M. Test proof alarming. Where applicable, verify interface between unit packaged controls and BAS.
- N. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
- O. Simulate power outage and ensure automatic and orderly restart.
- P. In winter, verify operation of low ambient heat rejection control of DX circuit

3.9 VARIABLE REFRIGERANT TERMINAL UNITS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Check the calibration of zone temperature sensors.
- E. Verify the operation of the air-cooled condensing unit.
- F. Check the stability of the zone temperature control loop for the damper and any associated heating devices by changing the space set points and observing the response.
- G. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- H. Determine the optimal settings for the control parameters
- I. Simulate and test the unoccupied and emergency mode response of the terminal unit where applicable.
- J. Check the capacity of the heating device where applicable.

3.10 BUILDING AUTOMATION SYSTEM

- A. Participants shall include: Commissioning Authority and BAS.
- B. Refer also to Section 23 0859 for BAS Commissioning requirements.
- C. Commissioning Authority shall review Start-Up Procedure.
- D. Controls system sampling will typically correspond to the sampling rate of a system or piece of equipment. These sampling rates are indicated above for the respective item.

- E. Operate the equipment and subsystems through all specified modes of control and sequences of operation including full and part load conditions, and emergency conditions.
- F. Verify that equipment operates in accordance with design intent and approved control diagrams. This shall include checking the operation of dampers, valves, smoke detectors, high and low limit controls, of a sample of 25% of components with a maximum failure limit of 10%.
- G. Analog Input (AI) Sensors: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Spot-check AI sensors (space temperature sensors, outside, return, and mixed air temperature sensors, discharge air temperature sensors, chilled water and hot water temperature sensors, and humidity sensors, air and water differential pressure sensors, airflow monitoring stations, etc.) for specified accuracy.
- H. Analog Outputs - Valves, Dampers and Actuators: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Ensure that the valves and dampers modulate freely and their actuator's close-off or seal against the maximum pressure differential. Ensure that the actuators stroke throughout the correct range (correlated with the programmed range) under operations pressures anticipated and that the positioners are set correctly where applicable.
- I. Establish trends of control system points for a minimum of a two-week period prior to and throughout the Acceptance period. Trends shall be analyzed to identify any control problems, lack of capacity, control loops fighting or unstable or other operational anomalies.
- J. Automatic Switches: Spot-check (at a sample of 50% of the inputs on the sampled devices with a maximum failure rate of 10%) the operation of all automatic switches (pressure switches, current switches, flow switches, and others) to ensure that they are adjusted to proper make and break settings.
- K. Verify the standalone functionality of the controllers. Disconnect LAN communication wiring and ensure that the controller functions properly and that the loss of communication is acknowledged by the interface. Restore communications and ensure an orderly restoration to normal control.
- L. Verify that the BAS interface, BAS software, graphics and functions are in accordance with design intent and approved control diagrams.
- M. Check dial-in communications and internet access where applicable to ensure functionality.

3.11 LIGHTING AND LIGHTING CONTROL SYSTEM

- A. Participants shall include: CA, EC.
- B. Sample: 100%, Failure Limit 10%
- C. Review Factory-Certified Start-Up Tests. Commissioning agent may opt to attend demonstration of lighting controls.
- D. Verify occupancy sensor placement and test reliability of activation/deactivation.
- E. Test photocells for functionality and accuracy.

- F. Spot-check switches to ensure proper operation and circuiting.
- G. Spot-check lighting levels to ensure compliance with IES and/or the design requirements for the respective occupancy.
- H. Test operation of daylight dimming control system if applicable. Ensure lights are banked parallel to the daylight source.

END OF SECTION

SECTION 01 9119 – BUILDING ENVELOPE COMMISSIONING

PART 1 GENERAL

1.1 SUMMARY

- A. Requirements for Commissioning of the Building Envelope as related to:
- a. Water Control Assemblies and Systems
 - b. Air Control Assemblies and Systems
 - c. Thermal Control Assemblies and Systems
 - d. Vapor Control Assemblies and Systems
- B. Building Envelope Commissioning (BECx) is a quality-oriented process for verifying and documenting that the performance of building Envelope systems and assemblies meet defined objectives and criteria. The Commissioning process begins at project inception and continues through the life of the facility. The commissioning process includes specific tasks to be conducted during each phase to verify that design, construction, and training meets the owner's project requirements. Commissioning shall:
1. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations, and industry accepted minimum standards.
 2. Verify and document proper performance of equipment and systems.
 3. Satisfy the requirements for obtaining the Energy and Atmosphere Building Envelope Prerequisite for Fundamental Commissioning and Verification of LEED-NC v4
 4. Satisfy the requirements for obtaining the Energy and Atmosphere Credit for Enhanced Systems Commissioning, Enhanced Cx, Path 1, Option 2 for Building Envelope Commissioning (2 points) of LEED-NC v4
- C. The building envelope commissioning team is made up of the building envelope Commissioning Provider as well as representatives from the owner, architect, design engineers, general contractors, and subcontractors of certain construction trades. The lead person for each trade who will perform and/or supervise the work shall be the designated representative to the building envelope commissioning team. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- D. The BECx Provider shall have the responsibility for coordinating each step of the building enclosure commissioning process in coordination with the Owner.
- E. Refer to section 01 1913 (General Commissioning Requirements) of the Waverley Elementary School Specifications for definitions and abbreviations not included below:
- F. Approval: Acceptance that a material or system has been properly installed and is functioning in tested modes according to the Contract Documents.
- G. Building Envelope Commissioning Provider (BECx Provider): Contracted to Owner. BECx Provider directs and coordinates day-to-day building enclosure commissioning activities in coordination with the Owner and the CA.

- H. Commissioning Provider (Cx Provider): Typically contracted to Owner. Cx Provider directs and coordinates day-to-day MEP commissioning activities - excluding BECx activities.
- I. Commissioning Plan: Overall plan developed after bidding that provides structure, schedule, and coordination planning for commissioning process. A specific building enclosure section will be added into the project's commissioning plan.
- J. Simulated Condition: Condition created for testing component or system (e.g., applying pressure differential across the building enclosure concurrent with water spray to simulate a wind driven rain).
- K. Specifications: Construction specifications of Contract Documents.
- L. Mock-up: The activities where systems or materials are initially constructed and tested. Mock-ups are to be free standing and approved prior to the commencing full scale construction.
- M. Water Penetration: Under test conditions includes water:
 - 1. On an interior surface of the system or assembly;
 - 2. Within a system or assembly without a positive drainage path to the exterior of the building; or
 - 3. In a location where damage may occur by the presence of moisture.

1.2 REFERENCE STANDARDS

If LEED v4:

- A. ASHRAE Guideline 0–2005 - The Commissioning Process
- B. National Institute of Building Sciences (NIBS) Guideline 3–2012 - Exterior Enclosure Technical Requirements for the Commissioning Process

1.3 SUBMITTALS

- A. Owner's Project Requirements (OPR): A written document, prepared by the owner, outlining the owner's expectations and goals for the performance of the building upon project completion.
- B. Basis of Design (BOD): A written document, prepared by the Architect and design team, outlining the primary thought processes and assumptions behind the design decisions that were made to meet the Owner's Project Requirements. The Basis of Design describes the systems, components, conditions, and methods chosen to meet these requirements.
- C. Commissioning Plan: An overall plan, prepared by the Cx Provider and BECx Provider, which provides the structure, schedule and coordination planning for the commissioning process.
- D. Field Observations: The BECx Provider shall record observations, and measurements on performed tests. Photographs, forms, and other means appropriate for the application shall be included. BECx Provider shall compile site reports and include them in systems manual and commissioning report.
- E. Issues Log: BECx Provider shall prepare and maintain an issues log that describes design, installation, and performance issues that are in variance with the OPR, BOD, and Contract Documents. BECx Provider shall document corrective action taken for systems and equipment

that fail tests including the required modifications to systems and equipment and revisions to test procedures, as applicable.

- F. Final Commissioning Report: BECx Provider shall document results of the commissioning process including unresolved issues and performance of systems and assemblies. The commissioning report shall indicate whether systems are performing in accordance with the OPR, BOD, and Contract Documents. The commissioning report will be updated and re-submitted after the 10-month warranty site observation.
- G. The Trade Contractors shall provide copies of documents gathered or developed during the construction process to the Building Envelope Commissioning Provider in a timely and accurate manner. The documents required are:
- H. Construction schedule, including estimated dates for system installations and testing. Provide updated schedules as appropriate.
- I. Procedures and status reports, including deficiencies noted.
- J. Minutes from all meetings concerning building envelope contractors and/or the building envelope commissioning process.
- K. Field checklists used by the field technicians. Refer to Appendix I of this section for sample checklists.
- L. As-built records, including approved submittals, warranties, and operations manuals.

1.4 QUALITY ASSURANCE

- A. Appropriate personnel (i.e. Project Manager and/or Field Foreman) employed by the Contractor and shall assist the BECx Provider in coordinating and executing the required commissioning activities. These personnel shall become familiar with the Commissioning Plan and shall coordinate the tasks, documentation and submissions required by this Plan. These personnel shall review these documents for compliance with the commissioning requirements and shall arrange for remedies to deficiencies noted in these documents.
- B. The owner has engaged an independent Building Envelope Commissioning Provider (BECx Provider). The Contractor shall properly coordinate with the BECx Provider throughout the construction of the project.
- C. The BECx Provider will be an objective advocate of the owner observing the commissioning activities of the Contractor and will make final recommendations to the owner regarding functional performance of the commissioned building systems. The BECx Provider will prepare a Commissioning Plan for coordination with the design/build team to assure an efficient design and construction process.
- D. All approved submittal data for building envelope systems and components to be commissioned shall be submitted to the BECx Provider for use in the BECx process. The Contractor shall submit additional copies of submittals, as requested, for the use in the Building Envelope Commissioning process.
- E. The Contractor shall schedule the work considering the activities to be performed by the Building Envelope Commissioning Provider. No claim for delay or request for an extension of Contract Time will be allowed as the result of the scheduled activities of the Building Envelope Commissioning Provider.

1.5 FIELD CONDITIONS – NOT USED

PART 2 PRODUCTS

2.1 TOOLS AND EQUIPMENT

- A. The appropriate Contractor shall furnish all special tools and equipment required during the commissioning process. The owner shall furnish necessary utilities for the commissioning process.

PART 3 EXECUTION

3.1 CONSTRUCTION CHECKLISTS

- A. Contractors to prepare detailed Construction Checklists for building envelope systems, assemblies, and components; submit Construction Checklists for review.
- B. Return construction checklists incorporating BECx Provider comments.
- C. When review comments have been resolved, BECx Provider will provide final Construction Checklists, marked "Approved for Use, (date)."
- D. Use only Construction Checklists, marked "Approved for Use, (date)."

3.2 BUILDING ENVELOPE COMMISSIONING (BECX) MEETINGS

- A. BECx meetings will be held periodically as determined by BECx Provider.
- B. Discussions held in BECx meetings shall include, but not be limited to, system/materials, mock-up/field, progress, scheduling, testing, documentation, deficiencies, and problem resolution.

3.3 REPORTING

- A. BECx Provider will provide status reports to CM, A/E and Owner as needed and/or after each site visit.
- B. BECx Provider shall submit non-compliance and deficiency reports to CM, A/E and Owner as needed and/or update after each site visit.

- C. BECx Provider shall provide a final summary report to the Owner at the completion of the project.
- D. BECx Provider shall provide a 10-Month Warranty review site observation and report after the completion of the project.

3.4 MOCK-UP AND FINAL CONSTRUCTION

- A. CM and Contractor shall verify completion of all assemblies compliant with project documents and deficiency log items prior to functional performance testing or concealment of functional performance layers within the building enclosure.

3.5 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope

- 1. The objective of Functional Performance Testing is to demonstrate each system is operating according to documented design intent and Contract Documents. Functional Performance Testing facilitates bringing systems from a state of substantial completion to fully operational. Additionally, during Functional Performance Testing, areas of deficient performance are identified and corrected, improving operation and functioning of systems.

B. Development of Test Procedures

- 1. The purpose of any given specific test is to verify and document compliance with the OPR. The BECx Provider shall develop specific test procedures for inclusion.

C. Coordination and Scheduling

- 1. Contractors will provide sufficient notice to BECx Provider regarding completion schedule for materials and systems. Contractors will schedule Functional Performance Tests with BECxT and BECxP. BECx Provider shall witness and document functional testing of materials and assemblies. BECxT shall execute tests under direction of BECx Provider. BECxT may be the same entity as the BECx Provider if deemed the best value to the project.
- 2. Successful completion of mock-up functional performance testing shall occur prior to full production installation of building enclosure materials and systems

D. Laboratory Mockup Testing

- 1. A project specific laboratory mockup testing is not required for this project beyond those required in the contract documents to prove manufacturer typical system and assembly conformance.

E. Onsite Off-Building Mockup Testing

1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
2. Integrated Exterior Mockup Testing Program: Perform the following tests in the following order:
 - a. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
 - c. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. (E283 6.24psf) Maximum air leakage of 0.06 cfm per sq.ft.
 - d. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration. (E331 12psf)
 - e. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
 - f. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
 - g. Sealant Durability: ASTM C794. Per Manufacturer's recommendations and stated values.
 - i. Use C1521 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints¹ instead for sealants

F. First Installation Mockup Testing

1. Wall Mockups: Perform the following tests in the following order:
 - a. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
 - c. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.06 cfm per sq.ft.
 - d. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
 - e. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
 - f. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
 - g. Sealant Durability: ASTM C794. Per Manufacturer's recommendations and stated values.

G. Roof Mockup: Perform the following tests in the following order:

1. Air Leakage Site Detection (Bubble Gun): ASTM E1186. No evidence of air penetration.
2. Flood Testing of Horizontal Waterproofing: ASTM D5957 or Electronic Leak Detection ASTM E7877. No evidence of water penetration for a minimum 48 hours with flood test.
3. Water-Spray Test for terminations and transitions: AAMA 501.2. No evidence of water penetration.
4. Horizontal Below-Grade Waterproofing and Slab-on-Grade Mockups: Perform the following tests in the following order:
 5. Flood Testing of Horizontal Waterproofing: ASTM D5957 or Electronic Leak Detection ASTM E7877. No evidence of water penetration for a minimum 48 hours with flood test.
 6. Water-Spray Test for terminations and transitions: AAMA 501.2. No evidence of water penetration.
7. Vertical Below-Grade Waterproofing Mockups: Perform the following tests in the following order:
 8. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
 9. Water-Spray Test for terminations and transitions: AAMA 501.2. No evidence of water penetration.
10. Building Expansion Joint Mockups: Perform the following tests in the following order:
 11. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
 12. Water-Spray Test for terminations and transitions: AAMA 501.2. No evidence of water penetration.

H. Building Enclosure Testing

1. Building Enclosure Testing: Perform testing before installation of interior finishes unless otherwise indicated.
2. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
3. Building Wall and Fenestration Testing: Perform the following tests in the following order on two exterior wall specimen approximately 12 feet tall and 20 feet wide to be designated by the Owner at each stage of completion, including 30%, 60%, and 90% of the Exterior Walls prior to the installation of exterior insulation or cladding (unless it is integral to the air and water control layer such as Insulated Metal Wall Panels):
 4. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
 5. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
 6. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.06 cfm per sq.ft.

7. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
8. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
9. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
10. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
11. Completed Roof Testing:
 - a. Flood Testing of Horizontal Waterproofing: ASTM D5957 or Electronic Leak Detection ASTM E7877. No evidence of water penetration for a minimum 48 hours with flood test.
 - b. Location of Wet Insulation in Roofing Systems: ASTM C1153. No wet insulation.
 - c. Complete Whole Building Air Barrier Testing
 - d. Whole Building Air Leakage Rate by Fan Pressurization: ASTM E3158. Maximum Air Leakage Rate: 0.40.

3.6 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

A. Documentation

1. BECx Provider will witness and document results of FPT.
2. Non-Conformances
 - a. BECx Provider will record results of functional testing. Deficiency or non-conformance issues will be noted and reported to CM, A/E and Owner.
 - b. Corrections of minor deficiencies identified may be made during tests at discretion of BECx Provider. In such cases, deficiency and resolution will be documented.
 - c. Every effort will be made to expedite testing and minimize unnecessary delays, while not compromising integrity of tests. BECx Provider shall not overlook deficient work or loosen acceptance criteria to satisfy scheduling or cost issues unless directed to do so by the Owner.
3. Deficiencies are handled in the following manner:
 1. When there is no dispute on deficiency and Contractor accepts responsibility for remedial action:
 - a. BECx Provider documents deficiency and Contractor's response and intentions and they go on to another test or installation. BECx Provider submits deficiency report to CM, A/E and Owner. Copy is provided to Contractor by CM. Contractor corrects deficiency and certifies that material or assembly is ready to be retested. CM informs BECxT and BECxP of retesting schedule.

- b. CM reschedules test with BECx Provider and BECxT.
- 2. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - a. BECx Provider documents deficiency and Contractor's response. BECx Provider submits deficiency report to CM, A/E and Owner. Copy is provided to Contractor by CM.
 - b. CM facilitates resolution of deficiency. Other parties are brought into discussions as needed. Final interpretive authority is with A/E. Final acceptance authority is with the Owner.
 - c. CM documents resolution process.
- 3. Once interpretation and resolution has been decided, appropriate party corrects deficiency, CM reschedules test, and test is repeated until satisfactory performance is achieved.

B. Cost of Retesting

- 1. Costs for all retesting will be the full responsibility of the Contractors and Sub-contractors. These costs include all access, equipment, labor, redeployment of test crews, and materials required to complete the retesting.

3.7 COMMISSIONING DOCUMENTATION

A. Final Report Details

- 1. Final commissioning report will include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, and general description of testing and verification methods. Report will contain evaluation regarding:
 - a. Conformance to specifications and design intent
 - b. Material/system installation
 - c. Functional performance
- 2. All outstanding non-compliance items will be specifically listed.
- 3. Recommendations for improvement to system or operations, future actions, etc. will also be listed.

END OF SECTION

SECTION 02085

ASBESTOS ABATEMENT SCOPE OF WORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. General: The intent of this project is to remove all friable asbestos-containing materials and non-friable materials that may be rendered friable during the planned demolition of the structure comprising Waverley Elementary School located at 201 Waverley Drive in Frederick, MD. This scope of work includes all work necessary to reduce air concentrations of asbestos to the specified level and maintain the specified asbestos control limits during the life of the contract. It is the intent of this specification to remove all friable asbestos-containing materials and non-friable materials with a potential to become friable using either full containments and/or glovebag techniques within regulated work areas. The Contractor is responsible for acquiring all necessary permits and variances to perform this project.
- B. Asbestos-containing materials have been identified in the report “Demolition Hazardous Materials Survey, Waverley Elementary School, Frederick, Maryland” prepared by AERO EH&S, Inc. and dated January 18, 2019.
1. Project Location:

Waverley Elementary School
201 Waverley Drive
Frederick, MD
 2. Description of the site:

The Waverley Elementary School building was constructed in 1969 With a small additional added in 2003 and totals 51,178 square feet.
 3. It is the Contractor’s responsibility to expose and remove all friable asbestos-containing materials and non-friable materials that may be rendered friable during demolition throughout the buildings.
 4. The asbestos-containing materials to be removed for this project are listed in the following table:

Table 1 – Identified Asbestos-Containing Materials

Sample Description	Location	Approximate Quantity	Friable	Condition	Asbestos, %
9" x 9" White Floor Tile and Mastic	Room A-4	150 SF	No	Good	<u>Tile</u> 4% Chrysotile <u>Mastic</u> 6% Chrysotile
3"–6" Mudded Pipe Fitting Insulation	Observed During AHERA Surveys	55 EA	Yes	Good	5% Amosite
6"–12" Mudded Pipe Fitting Insulation	Observed During AHERA Surveys	18 EA	Yes	Good	5% Amosite
Black/Cream Seam Mastic on F/G Pipe Insulation	Observed During AHERA Surveys	820 LF	No	Good	6% Chrysotile
Black Mastic on Foil Duct Insulation	Observed During AHERA Surveys	1,490 LF	No	Good	5% Chrysotile
Asbestos Cement Soffit Panels	(See Drawings)	3,200 SF	No	Good	12% Chrysotile
Chalkboard Adhesive	Classrooms (See Drawings)	136 SF	No	Good	ASSUMED
Wood Clad Fire Doors (labeled)	(See Drawings)	13 EA	No	Good	ASSUMED

LF = linear feet
SF = square feet

C. Quantities of materials to be removed, which are provided herein, are approximate estimates provided by the Project Designer. It shall be the responsibility of the Contractor to verify understanding and agreement with quantities provided prior to submitting a bid. If the Contractor bids for this work without disputing specified quantities of described materials, this shall indicate acceptance of a Scope of Work, which includes removal of all described materials, regardless of listed quantity.

D. The Contractor is responsible for exposing the chases, plenums, and ceilings to ensure that all of these materials have been removed. This work includes, but is not limited to, the demolition of suspended ceilings, block chase walls and plenums, and the removal of casework that may be on top of ACM flooring. Demolition debris that is not contaminated can remain on site for disposal with the rest of the structure, but must either be removed from the containment areas or sealed with plastic sheeting so as to not affect the final clearance air sampling.

1.02 QUALITY ASSURANCE

A. Contractor Qualifications: The Contractor shall be a firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field) who is regularly engaged in and who maintains a regular force of workmen skilled in asbestos abatement, and shall have performed this work on previous projects.

1. Contractors performing asbestos abatement work must be licensed to do asbestos work in the State of Maryland.
2. Contractor employees assigned to active asbestos work areas shall have and demonstrate current registration as asbestos abatement workers, at a minimum, in the State of Maryland.
3. Pursuant to NESHAP requirements, the Contractor should provide appropriate written notification at least 10 days prior to the start of asbestos abatement work to:

Asbestos Program Coordinator, Code 3AM 22
U.S. Environmental Protection Agency Region III
841 Chestnut Street
Philadelphia, PA 19107

and to:

Air & Radiation Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230
(410) 537-3000

B. Asbestos Control Limits: The enclosed work areas shall be defined as a regulated area in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101.

1. Inside Asbestos Work Area: For personnel wearing negative-pressure respirators, exposures to asbestos shall not exceed an 8-hour time weighted average of 0.1 fiber (longer than 5 microns) per cubic centimeter of air (f/cc). Regardless of the respiratory protection worn, air concentrations inside the work area will not exceed an 8-hour time weighted average of 1.0 f/cc. It is the responsibility of the Contractor to provide an independent industrial hygiene consultant to provide the required personal air monitoring and to ensure that all safety and health procedures are followed.
2. Outside Asbestos Work Area: Air concentrations of asbestos shall be maintained at the lowest attainable level and shall not exceed an 8-hour

time weighted average of 0.01 fiber per cubic centimeter of air. This applies to all areas in the building while work is in progress except for the asbestos work area, and to the entire building, including the former work area, after final cleanup. To ensure compliance with these standards, the Building Owner will provide the required air monitoring outside the Contractor's work area and the Building Owner's industrial hygienist will have unrestricted access to the Contractor's work site. The asbestos abatement contractor may perform any air sampling he wishes to ensure compliance with this standard. If a discrepancy arises between the Contractor's air monitoring results and the Building Owner's results, the Building Owner's results shall prevail.

1.03 SUBMITTALS

- A. Post-Award Asbestos Abatement Submittals: Items 1.03.A.1. through 1.03.A.7 below are to be submitted after the award, but are required to be approved by the Building Owner or his designated representative prior to starting work.
1. Abatement Plan: Submit a detailed site-specific plan of the procedures proposed for use in complying with the requirements and regulations included in this specification. The plan shall include the location and layout of decontamination areas, the sequencing of asbestos work, the interface of trades involved in the performance of work, and methods to be used to ensure the safety of building occupants and visitors to the site. Expand upon the use of portable HEPA ventilation system, closing out of the building's HVAC system during removal, method of removal to prohibit emissions in the work area, and packaging of removed asbestos debris.
 2. Disposal Plan: Prepare a disposal plan including the location of the approved disposal site and the Contractor's method for documenting proper asbestos disposal to the Building Owner or his designated representative.
 3. Environmental Protection Agency (EPA) Notification: Provide a copy of the NESHAPS Notification sent to the Regional EPA Asbestos Regulation Office (Paragraph 1.02).
 4. Local Government Notification: Provide a copy of the notification sent to the appropriate State or local Governmental Asbestos Regulation Office (Paragraph 1.02).
 5. Certificates of Compliance: Submit certification that vacuums, ventilation equipment, and other equipment required to contain airborne

asbestos fibers conform to ANSI Z9.2.

6. Information on Encapsulating Material: Submit written evidence that material meets the latest requirements of the EPA and possesses the specified characteristics.
 7. Laboratory Qualification Information: Submit proof of qualifications of testing laboratory and personnel. Accreditation by the American Industrial Hygiene Association (AIHA) for asbestos analysis and two consecutive quarterly reports showing that the laboratory analyzing the samples has been judged proficient by successful participation in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program shall be considered sufficient proof of compliance. This submittal must be approved by the Building Owner or his designated representative prior to beginning any testing.
- B. During Work Asbestos Abatement Submittals: Items 1.03.B.1 through 1.03.B.2 below are to be submitted to the Building Owner or his designated representative as work progresses at the time specified.
1. Air Monitoring and Work Area Information:
 - a. Air Monitoring Results: Results of all air monitoring conducted by the Contractor shall be posted within 24 hours of collection for all workers to see. A copy of the results shall be given to the Building Owner or his designated representative.
 - b. Differential Air Pressure Readings: Starting when a negative pressure containment is erected and approved by the Building Owner or his designated representative, a copy of the strip chart record of the work area relative pressure shall be submitted within 24 hours after the recording was made.
 - c. Work Area Inspections: The Building Owner's representative will perform visual inspections of the work area for the pre-commencement, final visual, and final clearance stages of the work. The Contractor shall notify the Building Owner or his designated representative at least 4 hours in advance of the required inspection.
 2. Transporting and Disposing of Asbestos-Containing Materials (ACM):
 - a. Disposal Receipts: Receipts from the landfill operator which acknowledge the Contractor's shipment of ACM from the site (NESHAPS Waste Shipment Records) shall be submitted three days

following removal of ACM from the premises. Each receipt shall provide date, quantity of material removed, and signature of an authorized representative of the transporter. A signed and dated copy of the Waste Shipment Record showing receipt at an authorized landfill must be received by the Building Owner's designated representative within 30 calendar days of the date of the shipping receipt.

- b. Transportation Vehicles: Transportation shall be in vehicles dedicated to asbestos transportation. Vehicles shall be marked in accordance with DOT and NESHAPS regulations.
 - c. Shipping Manifest Forms: Signed and completed Shipping Manifest Forms (NESHAPS Waste Shipment Records) shall be used for the transportation of ACM. This form shall be signed by each party who has control over the asbestos waste, and a copy retained by each party as responsibility for the waste is transferred to the next party.
- C. Final Submittals: Items 1.03.C.1 and 1.03.C.2 below are to be submitted to the Owner's designated representative at the completion of work for each work containment.
- 1. Daily Log: Copies of a daily log showing the date(s) and time(s) of entrance to and exit from the work area(s) for all persons.
 - 2. Re-Establish Systems - Submit written certification:

1.04 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to the protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State, and local regulations, and shall hold the Building Owner and his designated representative harmless for failure to comply with any applicable safety or health regulation on the part of himself, his employees, or his subcontractors.

1.05 PROJECT/SITE CONDITIONS

- A. Means of Egress: Establish and maintain emergency and fire exits from the work area.
- B. Decontamination Facility: Throughout the time that asbestos removal is

taking place, the abatement contractor will maintain a working three-stage decontamination facility at the point of access to the containment. As a minimum, the decontamination facility will consist of a clean changing area, an air space, a shower, another air space, and a contaminated changing area. The size and location of this facility shall be approved by the Building Owner's designated representative.

- C. Access to Work Area: Access to work areas shall be through decontamination areas. The following shall have access to work area:
 - 1. Building Owner or Designated Representative
 - 2. Contract Monitoring Personnel
 - 3. OSHA Inspectors
 - 4. EPA Inspectors
 - 5. State & Local Building or Health Officials
 - 6. Authorized Inspection Personnel

1.06 SEQUENCING/SCHEDULING

- A. Schedule and work hours must be approved by Frederick County Public Schools (FCPS).

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Equipment, including protective clothing and respirators used in the execution of this contract and provided to visitors to the site, shall comply with ASTM E849 and with applicable Federal, State, and local regulations. Respirators shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101, except that single use and disposable respirators shall not be used. Type of respirators required shall be as specified in 29 CFR 1926.1101. If any air sampling indicates levels above 5.0 fibers per cubic centimeter, supplied air (type "C") respirators will be required during actual removal operations. The minimum respiratory protection for this project is full-face powered air purifying respirators equipped with P100 (HEPA) cartridges.

2.02 ENCAPSULATING MATERIALS

- A. Encapsulating materials (sealants) shall meet the latest requirements of the EPA and shall possess the following characteristics:

1. Adherence: The sealant eliminates fiber dispersal by adhering to the fibrous substrate with sufficient penetration to prevent separation of the sealant from the sprayed asbestos material.
 2. Impact Penetration: It withstands impact and penetration, protects the enclosed sprayed asbestos material, and must not cause separation of sprayed asbestos material from its original substrate.
 3. Flexibility: It possesses enough flexibility to accommodate atmospheric changes and settling of the structure over time.
 4. Resistance to Smoke and Flame: It shall have high flame retardant characteristics and a low toxic fume and smoke emission rating.
 5. Ease of Application: It must be easily applied with relative insensitivity to errors in preparation or application. Ease of repair by routine maintenance personnel is desirable.
 6. Toxicity: The sealant must be neither noxious nor toxic to application workers and structure users thereafter.
 7. Permeability: It should have some permeability to water vapor to prevent condensation accumulation and be resistant to common cleaning agents.
 8. Stability: It should have suitable stability to weathering and aging.
- B. Guarantee: Guarantee encapsulating materials to perform for a period of 1 year, in accordance with "Guarantee" clause of the General Conditions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Isolate the work areas for the duration of the work by completely sealing off all openings and fixtures in the work area including, but not limited to, heating and ventilation ducts, doorways, corridors, windows, and lighting with plastic sheeting taped securely in place.
- B. Build double barriers of plastic sheeting at all entrances and exits to the work areas so that the work area is always closed off by one barrier. Build three-stage decontamination airlocks at the worker entrance to the work areas. The waste loadouts, if separate from the main decon, must be at least two-stage. Both decons must have working showers with proper discharge filtration.
- C. Place plastic drop cloths under all locations where glovebag removals will occur in the work area.
- D. Before the work commences, clean all removable items and equipment. Remove them from the work area and store, or dispose of off site, as directed.
- E. Cover all non-removable items and equipment in the work area with plastic sheeting taped securely in place.
- F. Remove all heating, ventilation, and air conditioning system filters, pack them in sealable plastic bags (6-mil minimum) for disposal in the approved waste disposal site, and replace them with new filters upon completion of abatement.
- G. Post warning signs on the primary containment as required by 29 CFR 1910.1001, 29 CFR 1926.1101, ASTM E849, and as directed by the Building Owner or his designated representative. State of Maryland signage shall be posted at all entrances three (3) days prior to the commencement of abatement activities.
- H. Obtain Written Approval of the Finished Primary Containment from the Building Owner's designated representative prior to starting any actual asbestos removal work.

3.02 WORK PROCEDURES:

- A. General Procedures: The enclosed work areas shall be defined as an asbestos regulated area and all asbestos worker protection and work practices not addressed in this specification shall be performed in conformance with the general safety and health provisions of 29 CFR 1910.1001, 29 CFR 1910.20 and 29 CFR 1926.1101, respectively. For asbestos abatement work, use general work practices, work practices for removal, and work practices for encapsulation as specified in ASTM E849, and other appropriate work procedures approved by the EPA. If a conflict arises, the more stringent application shall apply until a determination is made by the Owner or his designated representative.
- B. Local Exhaust System: Provide a local exhaust system in the asbestos control area as required to meet the asbestos control limit and ceiling concentration. The local exhaust system shall be in accordance with ANSI Z9.2, using HEPA filters. Equip exhaust openings with the necessary filters required to reduce the airborne asbestos concentration to below the asbestos control limit. Local exhaust equipment must be sufficient to maintain a minimum negative air pressure of 0.02 inch water gauge in the asbestos control area. In no case shall the building ventilation system be used as the local exhaust system for asbestos control. Filtering in vacuums and exhaust equipment shall conform to ANSI Z9.2; HEPA filters shall be used in all vacuums and exhaust equipment. If the local exhaust system does not exhaust directly to the outside, the exhaust equipment shall be tested for integrity with a dioctylphthalate (DOP) or equivalent smoke generator and spectrophotometer each time a containment is erected.
- C. Coordination of Work of all Trades: Coordinate the work of all trades to ensure that their work is performed in accordance with the applicable regulations and that the asbestos control limits are maintained at all times both inside and outside the asbestos work area.

3.03 NEGATIVE PRESSURE GLOVEBAG METHOD OF ASBESTOS REMOVAL:

- A. General: If specified and/or approved in writing by the Building Owner, when using the glovebag method for removing pipe insulation, personnel decontamination procedures may not be required. However, respiratory protection and disposable clothing will be required. Discard the clothing in accordance with paragraph "Disposal of friable asbestos."
- B. Procedure: Install the glovebag and negative pressure equipment according to manufacturer's recommendations. Cut covering on the insulation along the top seam to allow wetting of the insulation, and cut

cover all around section to be removed. Remove in small sections. Lower the insulation material carefully inside the glovebag. Do not permit it to drop.

- C. Removal of Glovebag and Disposal: Following removal of insulation, ensure that all visible material is inside the bag. Spray all tools in glovebag with amended water while it is still attached. Evacuate bag with portable HEPA vacuum and while the bag is collapsed, squeeze bag below tool pouch, and twist bag. Seal bag with tape or locking ties, separating the waste from the removal area. Vacuum the inside of the top of the glovebag and unsealed portion of the glovebag below. Keep HEPA vacuum connected until the glovebag is removed. Replace HEPA filters as recommended by manufacturer. Cut the glovebag along the top and sides, then remove it from the pipe. Wet pipe and wash all tools and removal area thoroughly. Dispose of glovebag, material, and contaminated equipment in accordance with Paragraph 3.05 C "Disposal of Friable Asbestos."

3.04 QUALITY CONTROL:

- A. Monitoring: Monitoring of airborne concentrations of asbestos shall be in accordance with 29 CFR 1910.1001, 29 CFR 1926.1101, and ASTM E849. Monitor the airborne concentration of asbestos before starting work to obtain a baseline fiber concentration in the affected areas. Then monitor once every four (4) hours, continuously during the course of the work inside the asbestos work area; one time daily outside the entrance to the asbestos work area and at the exhaust opening of the local exhaust system. If monitoring shows airborne concentrations greater than the asbestos control limits, stop all work, correct the conditions causing the excessive levels, and notify the Building Owner or his designated representative immediately. In addition, monitor the airborne concentrations of asbestos after final cleanup and removal of the enclosure of the asbestos control area in accordance with Paragraph 3.05 D "Final Cleanup and Removal of Enclosures."
- B. Site Inspection and Stop Work Orders: While performing asbestos abatement work, the Contractor shall be subject to on-site inspection by contracted inspection services. Work shall also be subject to inspection by OSHA and EPA inspectors and/or local building or health officials. If found to be in violation by one of these officials, the Contractor shall cease all work immediately. Until the violation is resolved, standby time required to resolve the violation shall be at the Contractor's expense. One complete set of equipment (such as respirators and disposable clothing) required for entry to the asbestos control area shall be made available within two (2) hours of request by the Building Owner or his designated representative for inspection of the asbestos control area. Such requests will only be made

during the Contractor's working hours.

3.05 CLEANUP AND DISPOSAL:

- A. Permits and Notifications: Secure necessary permits in conjunction with asbestos removal, hauling, and disposition and provide timely notification of such actions, as may be required by Federal, State, regional, and local authorities. Notify the Regional Office of the United States Environmental Protection Agency and provide copies of the notification to the Building Owner or his designated representative 10 days prior to the commencement of the work. Provide notification in accordance with 40 CFR 61.22(d)(1) (See Paragraph 1.02).
- B. Housekeeping: Essential parts of asbestos dust control are housekeeping and cleanup procedures. Maintain all surfaces throughout the building free of accumulations of asbestos fibers to prevent further dispersion. Give meticulous attention to restricting the spread of dust and debris, keep waste from being distributed over the general area or to lower floors. Use approved industrial vacuum cleaners with a HEPA filter to collect dust and small scrap. Blowing down of the space with compressed air is forbidden. Post appropriate asbestos hazard warning signs. In all possible instances, workmen shall clean up their own areas. Equip personnel engaged in cleaning up asbestos scrap and waste with necessary respiratory equipment and protective clothing.
- C. Disposal of Friable Asbestos: Collect and dispose of friable asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing which may produce airborne concentrations of asbestos fibers in sealed impermeable bags. Prior to placing in bags or containers, wet down asbestos wastes to reduce airborne fiber concentrations. Waste asbestos material shall be disposed of in accordance with all Federal regulations at a sanitary landfill that meets EPA requirements. The contractor will provide the Building Owner or his designated representative with a copy of all hazardous waste manifests, haulers receipts, or landfill receiving tickets resulting from the disposal of the asbestos waste. Establishment of any on-site temporary holding area for properly packaged asbestos waste must be approved by the Building Owner or his designated representative.
- D. Final Cleanup and Removal of Enclosure: The Contractor must notify the Building Owner or his designated representative that the work area is ready for final inspection. Visible asbestos materials, dust, or debris is not permitted on any surface in or around the work area. Clean work area in accordance with EPA approved methods. The Building Owner's industrial

hygienist will perform PCM and/or TEM air sampling for clearance purposes in accordance with EPA regulations and as allowed by the State of Maryland. Perform sampling in an aggressive manner, using fans or similar equipment to create exaggerated air movement during the clearance air sampling. If the airborne fiber concentration is less than the level recommended by EPA/State of Maryland, the Building Owner or a designated representative may authorize removal of the enclosure. ***The Building Owner's approval of final cleaning and restoration of the work is required.***

END OF SECTION 02085

SECTION 02086

MERCURY-CONTAINING FLUORESCENT TUBE AND LAMP REMOVAL

1.01 DESCRIPTION OF WORK:

General: The scope of this section is to remove all mercury-containing light tubes from Waverley Elementary School located at 201 Waverley Drive in Frederick, MD.

1.02 RELATED DOCUMENTS

- A. General provisions of the Contract, including bonding, insurance, and other specification sections, apply to this section.
- B. The report "Demolition Hazardous Materials Survey, Waverley Elementary School, Frederick, Maryland" prepared by AERO EH&S, Inc. and dated January 18, 2019 provides a summary of hazardous materials to be removed.

1.03 SUBMITTALS

- A. Prior to beginning work on this contract, the Contractor should submit for approval a plan of procedures for handling and disposing of all fluorescent light tubes and other mercury-containing lighting fixtures and switches located throughout the facility. The plan must include:
 - 1. The location and configuration of work areas where mercury-containing fluorescent tubes and lamps will be removed. The work area shall be isolated temporarily by use of plastic sheeting or other method so that any accidental contamination will not spread to unrestricted areas of the building.
 - 2. The sequencing of mercury-containing tube and lamp removal work, the interface of trades involved in the performance of work, and methods to be used to ensure the safety of building occupants and visitors to the site.
 - 3. A method to ensure no contamination of the building or any equipment therein.
 - 4. Provisions to demonstrate that no release of mercury occurred during the project. Airborne levels of mercury are not to exceed 0.05 milligram

per cubic meter of air.

5. A contingency plan for response to suspected release of mercury vapor or phosphate dust. This should include notification of the Owner or the Owner's Representative, environmental testing, and clean up of any contamination resulting from Contractor activities. The contingency plan shall include environmental sampling performed by entities meeting the requirements specified elsewhere in this document.
 6. Packaging of removed mercury-containing tubes and lamps and labeling of containers. If the tubes/lamps will be handled as hazardous waste, the weight of each container is to be recorded (in pounds) and entered on the manifest. Each container is to be assigned a unique identifier number. This number is to be marked clearly on the outside of the container.
 7. A disposal plan including location of an EPA-approved disposal site, qualifications of the transporter, methods of transport, and a description of the methods to be employed to prevent any release to the environment.
 8. Manifesting procedures to be used. Each manifest is to be assigned a unique number. Provide legible copies of manifests to the Owner or the Owner's Representative.
 9. Provision of disposal receipts to the Owner or the Owner's Representative as well as provision of a signed copy of the manifest within 30 days of receipt of material.
 10. Alternative procedures for tube and lamp disposal such as off-site recycling (crushing and collection of mercury vapor and metal constituents).
- B. Procedures shall ensure compliance with the regulations listed below:
1. 29 CFR 1910 - Occupational Safety and Health General Industry
 2. 29 CFR 1926 - Occupational Safety and Health Construction Industry
 3. 40 CFR - US Environmental Protection Agency Regulations for Toxic Waste.
 4. Applicable State of Maryland regulations
- C. The plan must be approved by the Owner or his designee prior to commencement of work.

- D. The Contractor shall be a firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field) which is regularly engaged in mercury-containing tube and lamp removal.
- E. Any laboratory utilized to analyze mercury samples shall be accredited by the American Industrial Hygiene Association (AIHA).
- F. Industrial hygiene sampling shall be performed as necessary under the direction of an industrial hygienist certified by the American Board of Industrial Hygiene.
- G. The Owner reserves the right to perform any sampling deemed necessary, and the Contractor will receive a copy of the results.
- H. The Owner or Owner's Representative and any OSHA or EPA Inspectors shall be given unrestricted access to all work areas.
- I. Personnel monitoring and respiratory protection for contract employees are the sole responsibility of the Contractor; however, the contractor must provide a copy of the results of such sampling to the Owner or Owner's Representative when these tests are performed.

END OF SECTION 02086

SECTION 02087

PCB LIGHT BALLAST REMOVAL

1. 1.01 DESCRIPTION OF WORK:

General: The scope of this section is to remove all PCB-containing light ballasts from the Waverley Elementary School located in Frederick, Maryland. All ballasts without a "no PCBs" label shall be assumed to contain PCBs and shall be handled in full accordance with this specification.

1. Prior to beginning work on this contract, the Contractor should submit a plan of procedures for identifying, handling and disposing of all PCB light ballasts. The contractor will be responsible for inspecting all light fixtures for "No PCBs" labeling. Ballasts without this labeling are to be assumed to contain and shall be handled in accordance with applicable handling and disposal regulations including but not limited to EPA's Toxic Substances Control Act (TSCA) and EPA's Resource Conservation and Recovery Act (RCRA). The plan must include:
 2. A. The location and configuration of work areas where ballasts will be removed. This location shall either be a restricted access area such as a transformer vault or it shall be isolated temporarily by use of plastic sheeting or other method so that any accidental contamination will not spread to unrestricted areas of the building.
 3. B. The sequencing of PCB removal work, the interface of trades involved in the performance of work, methods to be used to assure the safety of building occupants and visitors to the site.
 4. C. A method to ensure no contamination of the building or any equipment therein.
 5. D. Provisions to demonstrate that no release of PCB occurred during the project. Surface contamination shall be defined as equal to or greater than 10 micrograms of PCB per 100 square centimeters. Airborne levels of PCB are not to exceed 1 microgram per cubic meter of air.
 6. E. A contingency plan for response to suspected release of PCBs. This should include notification of the Owner or the Owner's Representative, environmental testing, and clean up of any contamination resulting from Contractor activities. The contingency plan shall include environmental sampling performed by entities meeting the requirements specified

elsewhere in this document.

7. F. A provision for handling and disposing of any light fixtures which appear to have ballasts which may have leaked.
8. G. Packaging of removed PCB items and labeling of containers. The weight of each container is to be recorded (in pounds) and entered on the manifest (recommend limiting to 600 lbs for handling purposes). Each container is to be assigned a unique identifier number. This number is to be marked clearly on the outside of the container.
9. H. A disposal plan including location of an EPA approved disposal site, qualifications of the transporter, methods of transporter, methods of transport, and a description of the methods to be employed to prevent any release to the environment.
10. I. Manifesting procedures (in accordance with 40 CFR Part 761) to be used. Each manifest is to be assigned a unique number. Provision of legible copies of manifests to the Owner or the Owner's Representative.
11. J. Provision of Certificates of Destruction to the Owner or the Owner's Representative as well as a method to ensure that the disposal facility destroys the PCB material and provides a signed copy of the manifest within 30 days of receipt of material and a Certificate of Destruction within one year of receipt of the material.
12. K. Procedures shall ensure compliance with the regulations listed below:
 - 29 CFR 1910, Occupational Safety and Health General Industry
 - 29 CFR 1926, Occupational Safety and Health Construction Industry
 - 40 CFR, US Environmental Protection Agency Regulations for PCB.
 - 29 CFR 1910.120, OSHA Hazardous Waste Operations and Emergency Response
 - Applicable Maryland Department of the Environment regulations
13. L. The plan must be approved by the Owner or the Owner's Representative prior to commencement of work.
14. M. The Contractor shall be a firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the

same field), which is regularly engaged in PCB removal.

15. N. Any laboratory utilized to analyze PCB samples shall be accredited by the American Industrial Hygiene Association (AIHA) for organic materials analysis.
16. O. Industrial hygiene sampling shall be performed under the direction of an industrial hygienist certified by the American Board of Industrial Hygiene.
17. P. The Owner reserves the right to perform any sampling deemed necessary, and the Contractor will receive a copy of the results.
18. Q. The Owner or Owner's Representative and any OSHA or EPA Inspectors shall be given unrestricted access to all work areas.
19. R. Personnel monitoring and respiratory protection for contract employees are the sole responsibility of the Contractor, however the contractor must provide a copy of the results of such sampling to the Owner or Owner's Representative when these such tests are performed.

END OF SECTION 02087

SECTION 02090

LEAD-BASED PAINT REMOVAL AND DISPOSAL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification addresses the removal (including clean up) and disposal of lead-based paint that is being removed to reduce or eliminate lead hazards.
- B. Areas where lead-based paint is to be disturbed by torch cutting are required to have the paint removed in accordance with this Section.
- C. The Contractor shall provide all labor, materials, tools, equipment, services, testing, supervision, and incidentals necessary to perform the work of lead-based paint removal (including clean up) and disposal in accordance with the following specifications.
- D. The Contractor shall perform all work in compliance with Occupational Safety and Health Administration (OSHA) and State of Maryland regulations. This specification does not attempt to implement the OSHA and State of Maryland regulations for Contractors, but rather focuses on the prevention of lead contamination of employees, visitors, and the environment.

1.02 RELATED DOCUMENTS

- A. Lead-based and lead-containing paint have been identified on various surfaces as presented in the report "Demolition Hazardous Materials Survey, Waverley Elementary School, Frederick, Maryland" prepared by AERO EH&S, Inc. and dated January 18, 2019.
- B. DEFINITIONS
 - A. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air ($30 \mu\text{g}/\text{m}^3$) averaged over an 8-hour period.
 - B. Air Monitoring: Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.
 - C. Certified Industrial Hygienist (CIH): As used in this section, refers to an industrial hygienist retained by the Contractor who is certified by the

American Board of Industrial Hygiene in comprehensive practice.

- D. Eight-Hour Time-Weighted Average (TWA): Airborne concentration of lead to which an employee is exposed averaged over an 8-hour workday.
- E. HEPA Filter Equipment: High-efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining lead-containing dust. HEPA filters have a 99.97 percent efficiency for retaining particles of 0.3 micron or greater in size.
- F. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
- G. Lead Control Area: An area physically roped or partitioned off around a lead-based paint removal area which limits unauthorized entry of personnel.
- H. Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) as an 8-hour time weighted average as determined by OSHA.

1.03 REFERENCES

- A. The Contractor shall comply with the following regulations:
 - 1. Code of Federal Regulations:
 - a. US Department of Labor, Occupational Safety and Health Administration, Lead Exposure on Construction, 29 CFR 1926.62.
 - b. US Environmental Protection Agency, Resource Recovery and Conservation (RCRA), 40 CFR 260 through 265.
 - c. EPA 40 CFR 745, Subpart L – Lead-Based Paint Activities
 - 2. State of Maryland:
 - a. COMAR

1.04 SUBMITTALS

- A. The Contractor shall submit to the Owner's Representative the following:
 - 1. Starting and estimated completion dates of the work.
 - 2. Job-specific lead-based paint removal techniques to be used.
 - 3. Copies of certificates of training for each employee working.
 - 4. Product data (e.g., manufacturer's technical literature, brochures, material safety data sheets [MSDS], etc.) for each chemical product proposed for use.

5. The name and location of the waste disposal site and, following disposal, a copy of the completed manifest, signed and dated by the transporter.
6. Procedures for air monitoring including the name and address of the Contractor to perform air monitoring, a listing and qualifications of all personnel assigned to the project, and a detailed description of the procedures for air monitoring to be used for this project.

1.05 CONTRACTOR EMPLOYEE PROTECTION:

- A. The Contractor shall ensure that its employees are protected in accordance with all applicable Federal, State, and local regulations, in particular the US Department of Labor, Occupational Safety and Health Administration "Lead Exposure in Construction", 29 CFR 1926.62, and State of Maryland regulations.
- B. All Contractor employees who perform lead-based paint removal (including clean up) or disposal shall have successfully completed a State of Maryland approved training course in lead-based paint abatement within the previous two (2) years.
- C. All persons, when present in the lead control areas, shall wear disposable clothing and shoe covers.
- D. The Contractor shall ensure that its employees have received lead paint medical screening and have been certified by a physician to be able to work while wearing a respirator.

PART 2 PRODUCTS

2.01 REMOVAL TECHNIQUES

- A. The Contractor shall use one or more of the following approved lead-based paint removal techniques:
 1. Component removal as approved by the Owner.
 2. Chemical stripping (non-flammable and not containing methylene chloride).
 3. Manual wet scraping limited to the removal of loose and peeling paint.
 4. Heat gun.
- B. Chemical stripping is considered a low airborne lead producing technique. OSHA has determined that this procedure generates airborne lead levels of less than 50 $\mu\text{g}/\text{m}^3$ (below the PEL).
- C. Manual wet scraping, heat gun use, and sanding using HEPA filtration are considered moderate airborne lead producing techniques. OSHA has

determined that these procedures generate airborne lead levels ranging from 50 to 500 $\mu\text{g}/\text{m}^3$ (1 to 10 times the PEL) unless air monitoring determines actual employee exposures.

- D. Sanding is considered a high airborne lead producing technique. The use of this technique is prohibited. OSHA has determined that this procedure generates airborne lead levels greater than 500 $\mu\text{g}/\text{m}^3$ (more than 10 times the PEL) unless air monitoring determines actual employee exposure.
- E. Abrasive blasting, torch burning, welding, and cutting are considered extremely high airborne lead producing techniques. OSHA has determined that these procedures generate airborne lead levels greater than 2500 $\mu\text{g}/\text{m}^3$ (more than 50 times the PEL) unless air monitoring determines actual employee exposure. The use of the techniques described above in this paragraph, or any other lead-based paint removal technique requiring the use of a negative air pressure enclosure by the OSHA or State of Maryland regulations above cited in this paragraph, is prohibited.
- F. Detailed procedures for each of the four approved lead-based paint removal techniques are described in **Appendices A** through **C** to this specification.

2.02 PHYSICAL BOUNDARIES AND CAUTION SIGNS

- A. At approaches to the lead control area, the Contractor shall establish physical boundaries by roping off the area to limit unauthorized entry of personnel and by displaying caution signs at least 500mm (20") x 350mm (14") in size which include the phrase "Caution Lead Hazard, Keep Out" in bold lettering at least 2 inches high.

2.03 AIR MONITORING

- A. Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62(d) and shall be performed by or under the direction of a qualified Safety Officer. Personal and area monitoring shall be performed during the entire lead-based paint removal (including clean up). Sufficient area monitoring shall be conducted at the physical boundary to the lead control area to ensure unprotected personnel are not exposed above the action level. If the boundary lead levels are at or above the action level, the Safety Officer shall stop the work, immediately correct the condition(s) causing the elevated levels, and notify the Owner's Representative. As a minimum, area monitoring shall be conducted daily on each shift in which lead paint removal (including clean up) is performed in areas immediately adjacent to the lead control area. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area.

2.04 CLEAN UP

- A. Surfaces of the lead control area shall be lined with plastic and maintained reasonably free of accumulations of paint chips and debris. The spread of chips and debris shall be controlled and shall be kept from being distributed out of the lead control area. Dry sweeping and the use of compressed air to clean the lead control area are prohibited. At the end of each shift and when the paint removal operation has been completed, the areas shall be cleaned of visible lead paint contamination by vacuuming with a HEPA filtered vacuum.
- B. Clean up will be performed by trained workers (see Paragraph 1.06). After the lead-based paint removal work is complete, all debris shall be removed and the first clean up completed as follows:
 - 1. All lead waste, including sealing tape, plastic sheeting, mop heads, sponges, filters and disposable clothing shall be deposited in double 4-mil thick plastic bags or single 6-mil thick plastic bags and the bags sealed.
 - 2. All surfaces in the lead control areas shall be cleaned with a HEPA filtered vacuum and then wet washed with a solution containing approximately 1 ounce of 5% trisodium phosphate to one gallon of water.
 - 3. After the surfaces have dried, HEPA filter vacuum cleaning shall be repeated until no visible residue remains.

2.05 WASTE DISPOSAL

- A. The Contractor shall collect lead-contaminated waste, scrap, debris, cleaning materials, stripping agent residues, wash water, equipment, and clothing. Test paint residue and debris, if applicable, in accordance with 40 CFR 261 for hazardous waste. The Contractor shall dispose of regulated lead-contaminated waste material at an EPA-approved hazardous waste treatment storage or disposal facility off property.
- B. All material, whether hazardous or non-hazardous, shall be disposed in accordance with laws and provisions and Federal, State, or local regulations.
- C. A certified hazardous waste transporter shall be used to transport any hazardous waste.

PART 3 EXECUTION

3.01 See Attached Appendices.

APPENDIX A
LEAD-BASED PAINT REMOVAL TECHNIQUES
Chemical Stripping Agents

PART 1 GENERAL

1.01 WORK COVERED UNDER OTHER SECTIONS

- A. The scope of work for providing clean up and disposal of waste material is covered under Section 2 of this specification.

1.02 WORK INCLUDED UNDER THIS SECTION

- A. Work under this section includes the furnishing of all labor, material, and equipment required to remove existing peeling lead-based paint by scraping and/or brushing after the paint has been softened by the application of a chemical stripping agent. Non-peeling lead-based paint shall remain in place.

PART 2 PRODUCTS

2.01 CHEMICAL STRIPPING AGENTS

- A. Chemical stripping agents shall be non-flammable and not contain methylene chloride. Chemical stripping agents shall be compatible with and not harmful to the substrate to which they are applied. Chemical stripping agents used on masonry surfaces shall contain an anti-stain formulation that inhibits discoloration of stone, granite, brick, or other masonry construction.

2.02 CHEMICAL STRIPPING AGENT NEUTRALIZERS

- A. Chemical stripping agent neutralizers shall be used on exterior surfaces only. Neutralizers shall be compatible with and not harmful to the substrate to which they are applied. Neutralizers shall also be compatible with the chemical stripping agent that has been applied to the surface substrate.

PART 3 EXECUTION

- 3.01 Chemical stripping agents and neutralizers shall be applied according to the recommendations of the manufacturer. Stripping agents shall not be allowed to penetrate wood or other fibrous substrates. The softened paint shall be removed by scraping or wire brushing.

PART 4 DAMAGES

- 4.01 The Contractor shall protect adjacent areas from damage from chemical stripping agents during the course of work. Damages to non-protected adjacent areas from chemical stripping agents shall be repaired at the Contractor's expense.

APPENDIX B
LEAD-BASED PAINT REMOVAL TECHNIQUES
Manual Wet Scraping

PART 1 GENERAL

1.01 WORK COVERED UNDER OTHER SECTIONS

- A. The scope of work or clean up and disposal of waste material is covered under Section 2 of this specification.

1.02 WORK INCLUDED UNDER THIS SECTION

- A. Work included under this section includes the furnishing of all labor, materials, and equipment to remove loose or chipping lead-based paint from a limited area. Prior to painting, the edge substrate and the remaining paint must be feathered so that the entire surface is smooth and ready to receive paint.

PART 2 EQUIPMENT

- 2.01 None.

PART 3 EXECUTION

- 3.01 Lead-based paint will be wetted thoroughly with a garden mister before using a paint scraper, wire brush, or other abrasive tool. The use of a hose or other equipment which will wash the lead debris from the surface is prohibited.

APPENDIX C
LEAD-BASED PAINT REMOVAL TECHNIQUES
Heat Blower Gun Removers

PART 1 GENERAL

1.01 WORK COVERED UNDER OTHER SECTION

- A. The scope of work for providing clean up and disposal of waste materials is covered under Section 2 of these specifications.

1.02 WORK INCLUDED UNDER THIS SECTION

- A. Work included under this Section includes the furnishing of all labor, material and equipment required to remove existing peeling lead-based paint by heat, using a heat blower gun followed by scraping, as called out in these specifications. Paint shall be removed as required to remove peeling paint and to feather the edge of the peeling and non-peeling paint so that the substrate is smooth and ready to receive paint. Non-peeling lead paint shall remain in place.

PART 2 HEAT BLOWER GUN EQUIPMENT

- 2.01 Electrically-operated, heat blower gun shall be a flameless electrical paint softener type. The heat blower shall have electronically controlled temperature settings to restrict usage below a temperature of 700 degrees Fahrenheit. Heat blower shall be equipped with a variety of nozzles to cover all common applications (e.g., cone, fan, glass protector, spoon reflector, etc.).

PART 3 EXECUTION

- 3.01 The hot air stream from the heat-blower gun shall be directed at the painted surface and the paint allowed to blister and soften. Considerable lead volatilizes from lead-based paint and lead fumes are released at approximately 700 degrees Fahrenheit. Respiratory protection is required for all persons in the work area.
- 3.02 Softened paint shall be removed in the same manner required to remove peeling paint and prepare the surface for painting by scraping and/or wire brushing.

PART 4 DAMAGES

- 4.01 Care shall be taken to protect glass in windows and doors and adjacent areas

from damage from thermal stresses induced by the concentrated heat of the heat blower gun. Damages to non-protected glass and adjacent areas from thermal stresses shall be repaired at the Contractor's expense.

APPENDIX D

SUMMARY OF OSHA LEAD IN CONSTRUCTION REQUIREMENTS

(US Department of Labor, Occupational Safety and Health Administration "Lead Exposure in Construction", 29 CFR 1926.62)

AIRBORNE LEAD LEVELS ABOVE THE PERMISSIBLE EXPOSURE LIMIT (50 µg/m³)

-) Conduct periodic air monitoring.
-) Use feasible engineering and work practice controls.
-) Provide respirators, protective clothing, and equipment.
-) Institute a housekeeping and personal hygiene program.
-) Provide area for eating and drinking.
-) Provide washing and lavatory facilities.
-) Conduct medical surveillance (e.g., periodic blood lead testing).
-) Train employees via a 6-hour Maryland-approved course.
-) Post warning signs.
-) Maintain records.

AIRBORNE LEAD LEVELS BELOW THE PERMISSIBLE EXPOSURE LIMIT (50 µg/m³) BUT ABOVE THE ACTION LEVEL (30 µg/m³)

-) Conduct periodic air monitoring.
-) Institute a housekeeping and personal hygiene program.
-) Provide washing and lavatory facilities.
-) Conduct medical surveillance (e.g., periodic blood lead testing).
-) Train employees via a 6-hour Maryland-approved course.
-) Maintain records.

ANY LEVEL OF AIRBORNE LEAD

-) Institute a housekeeping and personal hygiene program.
-) Provide washing and lavatory facilities.
-) Inform employees of the requirements of these regulations.

END OF SECTION 02090

SECTION 02091

LEAD-CONTAINING PAINT REMOVAL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification addresses the removal (including clean-up) and disposal of lead-containing paint that is not being removed to reduce or eliminate lead hazards. All work being performed to reduce or eliminate lead hazards must be completed in accordance with Section 02090.
- B. Areas where lead-based paint is to be disturbed by torch cutting are required to have the paint removed in accordance with Section 02090.
- C. The Contractor shall demolish all items on the project drawings as noted in accordance with this section.
- D. The Contractor shall perform all work in compliance with the Occupational Safety and Health Administration (OSHA) and State of Maryland regulations. This specification does not attempt to implement the OSHA and State of Maryland regulations for Contractors, but rather focuses on the prevention of lead contamination of employees, visitors, and the environment.

1.02 RELATED DOCUMENTS

- A. Lead-based and lead-containing paint has been identified on various surfaces as presented in the report "Demolition Hazardous Materials Survey, Waverley Elementary School, Frederick, Maryland" prepared by AERO EH&S, Inc. and dated January 18, 2019.

1.03 DEFINITIONS

- A. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) averaged over an 8-hour period.
- B. Air Monitoring: Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.
- C. Certified Industrial Hygienist (CIH): As used in this section, refers to an industrial hygienist retained by the Contractor who is certified by the American Board of Industrial Hygiene in comprehensive practice.

- D. Eight-hour Time-Weighted Average (TWA): Airborne concentration of lead to which an employee is exposed averaged over an 8-hour workday.
- E. HEPA Filter Equipment: High-efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining lead-containing dust. HEPA filters have a 99.97 percent efficiency for retaining particles of 0.3 micron or greater in size.
- F. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.
- G. Lead Control Area: An area physically roped or partitioned off around a lead-based paint removal area which limits unauthorized entry of personnel.
- H. Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) as an 8-hour time weighted average as determined by OSHA.

1.04 REFERENCES

- A. The Contractor shall comply with the following regulations:
 - 1.
 - 2. 1. Code of Federal Regulations:
 - a. US Department of Labor, Occupational Safety and Health Administration, Lead Exposure on Construction, 29 CFR 1926.62.
 - b. US Environmental Protection Agency, Resource Recovery and Conservation (RCRA), 40 CFR 260 through 265.
 - c. EPA 40 CFR 745, Subpart L – Lead-Based Paint Activities
 - 2. State of Maryland:
 - a. COMAR

1.05 SUBMITTALS

- A. The Contractor shall submit to the Owner's Representative the following:
 - 1. 1. Starting and estimated completion dates of the work.
 - 2. 2. Job-specific lead-based paint removal techniques to be used.
 - 3. 3. Copies of certificates of training for each employee working.
 - 4. 4. Product data (e.g., manufacturer's technical literature, brochures, material safety data sheets [MSDS], etc.) for each chemical product proposed for use.

5. 5. Name and location of the waste disposal site and, following disposal, a copy of the completed manifest, signed and dated by the transporter.
6. 6. Procedures for air monitoring including the name and address of the Contractor to perform air monitoring, a listing and qualifications of all personnel assigned to the project, and a detailed description of the procedures for air monitoring to be used for this project.

1.06 CONTRACTOR EMPLOYEE PROTECTION

- A. The Contractor shall ensure that its employees are protected in accordance with all applicable Federal, State, and local regulations, in particular the US Department of Labor, Occupational Safety and Health Administration "Lead Exposure in Construction", 29 CFR 1926.62 and State of Maryland regulations.

PART 2 PRODUCTS

2.01 AIR MONITORING

- A. Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and shall be performed by or under the direction of a qualified Safety Officer.

PART 3 EXECUTION

3.01 Airborne lead levels above the permissible exposure limit (50 µg/m³)

- A. Conduct periodic air monitoring.
- B. Use feasible engineering and work practice controls.
- C. Provide respirators, protective clothing, and equipment.
- D. Institute a housekeeping and personal hygiene program.
- E. Provide area for eating and drinking.
- F. Provide washing and lavatory facilities.
- G. Conduct medical surveillance (e.g., periodic blood lead testing).
- H. Train employees via a 6-hour Maryland-approved course.
- I. Post warning signs.

- J. Maintain records.
- 3.02 Airborne lead levels below the permissible exposure limit (50 $\mu\text{g}/\text{m}^3$) but above the action level (30 $\mu\text{g}/\text{m}^3$)
- A. Conduct periodic air monitoring.
 - B. Institute a housekeeping and personal hygiene program.
 - C. Provide washing and lavatory facilities.
 - D. Conduct medical surveillance (e.g., periodic blood lead testing).
 - E. Train employees via a 6-hour Maryland-approved course.
 - F. Maintain records.
- 3.03 Any level of airborne lead.
- A. Institute a housekeeping and personal hygiene program.
 - B. Provide washing and lavatory facilities.
 - C. Inform employees of the requirements of these regulations.

END OF SECTION 02091

SECTION 02 3200 - GEOTECHNICAL INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. A Soils Report dated November 1, 2019, prepared by Hillis-Carnes Engineering Associates, is included in the project manual.
- B. The Soils Report and additional test report information was performed as part of this Contract.

1.3 SITE CONDITIONS

- A. Site Information
 - 1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings.
 - 2. It is to be expressly understood that the Owner will not be responsible for interpretations or conclusions drawing there from by Contractor. Data is made available for convenience of Contractor.
 - 3. The locations of test borings at various points are shown in the report. While it is believed the results of the test boring accurately indicate the existing soil conditions below the surface at points and planes indicated, the Owner, the Architect, and Engineer assume no responsibility for the actual conditions which may be encountered in the execution of the contract.
 - 4. Additional test borings and other exploratory operations may be made by Bidder or Contractor at no cost to Owner.

1.4 WARRANTY

- A. Neither the Owner, the Architect, or the Engineer, represent, warrant or guarantee that the materials actually encountered in the prosecution of the work, or any part thereof, will be of the same character as those indicated by the sample or logs of the test borings, and if the Contractor relies, for any purpose, upon the accuracy or completeness of said borings or log information, he does so at his own risk.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

HILLIS-CARNES

ENGINEERING ASSOCIATES

Revised Report of Subsurface Exploration and
Geotechnical Engineering Services
New Waverley Elementary School
191 & 201 Waverley Drive
Frederick, MD
HCEA Project Number: 19418A

November 1, 2019

Prepared For:

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November 1, 2019

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Subject: Revised Report of Geotechnical Engineering Services
New Waverley Elementary School
191 & 201 Waverley Drive, Frederick, MD
HCEA Project Number: 19418A

Mr. Moir:

Hillis-Carnes Engineering Associates, Inc. (HCEA) is pleased to submit this revised report concerning the subsurface exploration and subsequent geotechnical evaluation for the proposed construction of a new elementary school at the above referenced project site in the City of Frederick, Maryland.

We wish to advise you that the boring samples will be stored at our Frederick, Maryland office for a period of 30 days from the date of this letter. Should you wish the samples to be stored for a longer period of time or to be delivered to you or another party, please advise us in writing prior to the end of the 30-day period. Otherwise, the samples will be discarded at the end of the 30-day storage period.

HCEA appreciates having had the opportunity to provide the geotechnical consultation for this project, and we will remain available for further consultation during the various design stages. In order to provide complete professional services, we strongly recommend that inspection of the geotechnical aspects of construction be conducted by HCEA. This will help to verify that the construction operations are performed in accordance with the design recommendations of this report and the overall project plans and specifications. Should you have any questions concerning the contents of this report, or require additional consultation, design, inspection, or testing services, please contact our Office.

Very truly yours,
HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Robel Gibbe, P.E.
Project Engineer

Rajesh K. Goel, P.E.
Principal Engineer

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Report of Geotechnical Engineering Services
New Waverley Elementary School
191 & 201 Waverley Drive, Frederick, MD
Frederick, Maryland
HCEA Project Number: 19418A

1.0 PURPOSE AND SCOPE

The purpose of this study was to determine the general subsurface conditions at the boring locations and to evaluate those conditions with respect to concept and design of foundations for the proposed construction. More precisely, the scope of the study included the following objectives:

1. To determine the existing subsurface conditions, including the soil, rock, and groundwater conditions, within the area of the proposed construction.
2. To recommend the appropriate foundation and slab systems for the proposed building along with necessary design criteria.
3. To provide our recommendations for pavement subgrade preparations along with pavement cross section design.
4. To evaluate the site relative to the proposed construction of storm water management (SWM) facilities.
5. To determine and discuss any likely geotechnical-related design or construction problems.

The evaluations and recommendations presented in this report were developed from an analysis of project characteristics and an interpretation of the general subsurface conditions at the site based on the boring information. The stratification lines indicated on the boring logs represent the approximate boundaries between soil types. In-situ, however, the transitions may be gradual. Such variations can best be evaluated during construction and, if necessary, any minor design changes can be made at that time.

An evaluation of the site with respect to potential construction problems and recommendations dealing with the earthwork and inspection during construction are also included. The inspection is considered necessary to verify the subsurface conditions and to verify that the soils-related construction phases are performed properly.

The Appendix contains a summary of the field work on which this report is based.

2.0 PROJECT CHARACTERISTICS

The project site is currently occupied by Waverley Elementary School and Rock Creek School. The proposed project consists of demolition of the existing schools and construction of a new prototype elementary school building, associated parking, and storm water management (SWM) facilities. Proposed school building will be a one to two-story slab-on-grade structure. No below grade construction is anticipated for this project.

Precise loading information has not been provided but is anticipated to be moderate. It is our understanding that the planned finished floor slab elevation of the building is expected to be 410 (+/-) feet. To attain the proposed finished floor elevation, cuts up to 3 +/- feet and fills up to 2 +/- feet will be required in various areas of the proposed building based on the elevations of the borings.

Should any of the project characteristics, structural loading conditions or listed criteria from those outlined above, then this office should be contacted for a re-evaluation of the site.

3.0 FIELD EXPLORATION

In order to determine the general foundation soil types and to develop design parameters, a total of fifty (50) SPT borings (30 building, 9 parking and 11 SWM) were drilled at the site during this investigation. It should be noted that 12 borings (PB-1 to PB-12) were previously drilled during the preliminary investigation stage of the project. The building borings (B-1 to B-30) were extended to depths of 20 feet, the parking borings (P-1 to P-9) were extended to depths of 8 feet and the SWM borings (SWM-1 to SWM-11) were extended to depths of 12 feet. PVC pipes were installed in SWM borings SWM-1, SWM-4, SWM-6, SWM-8, SWM-10 and SWM-11 at a depth of 8 feet to perform in-situ infiltration testing. In-situ infiltration testing was not performed in the remaining borings. The boring locations were staked in the field by the project Civil Engineer. The approximate boring locations are shown on the Boring Location Plan (Drawing 3) included in Appendix B.

The borings were advanced with hollow-stem augers and the subsurface soils were sampled at 2.5 ft and 5.0 ft intervals. Samples were taken by driving a 1-3/8-inch I.D. (2-inch O.D.) split-spoon sampler from a 140-pound hammer falling 30 inches in accordance with ASTM D-1586 specifications. The number of hammer blows required to drive the sampler three consecutive 6-inch increments is recorded and the blows of the last two increments are summed to obtain "Penetration Resistance" or "N" value. The penetration resistance, when properly evaluated, is an index to the soil strength and compression characteristics.

Representative portions of each soil sample were placed in glass jars and transported to HCEA's laboratory. In the laboratory, the samples were visually examined by the Geotechnical Engineer to verify the driller's field classifications. The samples were classified in accordance with the Unified and USDA Soil Classification Systems and the field classifications were revised where necessary. The Unified Soil Classification Symbols appear on the Boring Logs and the system nomenclature is briefly described in Appendix B.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the site are shown on the Records of Soil Exploration (Boring Logs) in Appendix B. A brief description of the subsurface conditions and pertinent engineering characteristics of the soils are given below.

Most of the subsurface soils encountered in the borings have moderate to high swell potential. Refer the Construction in Expansive Soils section (7.6) of this report.

Strata divisions shown on the Boring Logs have been estimated based on visual examinations of the recovered boring samples. In the field, strata changes could occur gradually and/or at slightly different levels than indicated. Also, groundwater conditions indicated on the Boring Logs are those observed during the period of the subsurface exploration. Fluctuations in groundwater levels could occur seasonally and might also be influenced by changes in grading, runoff and infiltration rates, and other influencing factors.

Generalized subsurface conditions based on the results of the borings are discussed below:

4.1 Site Geology

The USGS geological map of Frederick County indicates that the project site is located over Harpers Formation (hf) of the Chilhowee Group. The formation consists of brown to dark bluish-gray banded shale, light bluish-gray, finely laminated phyllite; distinctively pale purple in basal part; bedding obscured by cleavage; increasingly metamorphosed toward east from shale to slate and phyllite; estimated thickness 2,000 feet.

In-situ chemical decomposition of the materials generally occurs as the result of percolating groundwater charged with carbon dioxide. The process typically produces a surficial layer of residual soils (soils formed in place and hence a resident of the area) having variable thickness and situated over the parent bedrock materials. Typically, the residual soils are silty and generally quite high in mica content. With depth, the soils generally increase in density and develop a remnant rock structure.

4.2 Surface Materials

Borings B-5, B-7, B-15, B-17, B-18, B-19, B-23, B-26, B-27, B-29, P-1, P-9, SWM-3, SWM-5, SWM-7, and SWM-9 were located in the asphalt paved drives and parking areas of the existing schools. The pavement at the locations of these borings consisted of 2 to 6 inches of asphalt concrete underlain by 2 to 6 inches of aggregate base. Boring B-22 was located within the existing children playground which had approximately 10 inches of mulch. The location of boring B-30 was also covered with approximately 4 inches of mulch. The remaining borings were covered with grass and the thickness of the topsoil encountered in these borings ranged from 3 to 4 inches. Pavement and topsoil/root mat thickness should be expected to vary across the site.

4.3 Fill Materials

Apparent fill materials were identified in all borings, except borings B-7, B-27, B-29, P-1, P-5, and SWM-5. The subsurface materials encountered in these 6 borings appeared to be natural soils or controlled fill materials. The fill materials encountered in the remaining borings extended to depths ranging between 2.5 and 13.5 feet below grade. The fill materials consisted of various combinations of lean clay, silt, sand and

gravel size rock fragments. Trace of organic and/or asphalt debris were encountered in the fill materials of most of the borings. The stiffness of the cohesive fill soils varied from soft to very stiff. The relative densities of the cohesionless fill soils ranged from very loose to medium dense.

Since the size of the samples obtained is relatively small in comparison to the area extent of the site and since fill materials could be of similar composition to the natural soils encountered at the site, it is often difficult to determine the presence and composition of fill materials from the SPT samples.

4.4 Natural Soil Materials

Below the surface or fill materials, natural soil materials were encountered in the test borings. The natural materials generally consisted of Fat CLAY (CH), Elastic SILT (MH), Lean CLAY (CL), SILT (ML), silty clayey SAND (SC-SM), clayey ROCK fragments with sand (GC), and silty ROCK fragments with sand (GM) with varying amounts of sand and rock fragments. **Most of the natural soils encountered in the borings have moderate to high swell potential.** The stiffness of the cohesive natural soils varied from medium stiff to very stiff. The relative densities of the cohesionless natural soils ranged from loose to medium dense.

4.5 Disintegrated Rock & Rock

Disintegrated Rock (also known as decomposed rock) is defined as a residual material with a penetration resistance (N-value) ranging from 60 blows per foot to 50 blows per 1-inch penetration. It typically retains the rock structure of the parent rock (i.e., is saprolitic) but exhibits the engineering characteristics of a soil when removed. Within a disintegrated rock zone, it is not uncommon to encounter slabs of rock, rock lenses, and/or boulders of intact rock. Disintegrated rock was not encountered in any of the borings within the drilled depths.

Rock is defined as natural material with a penetration resistance of at least 50 blows per 1 inch of penetration. Refusal to augering, probable top of ROCK, was not encountered at the boring locations within the drilled depths

4.6 Groundwater

Groundwater was monitored in the borings during and 24 hrs after completion of drilling activities. During these times, groundwater was not encountered in any of the borings. All of the borings caved-in after drilling completion.

A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers which could be monitored over an extended period of time. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending on variations in precipitation, surface run-off, infiltration, site topography, and drainage.

5.0 **DESIGN RECOMMENDATIONS**

5.1 **General**

The following findings and recommendations are based on our observations at the site, an interpretation of the field data obtained during the subsurface exploration, and our experience with similar subsurface conditions and projects. Soil penetration data has been used to estimate a net allowable soil design bearing pressure using established correlations. Subsurface conditions in unexplored locations may vary from those encountered. If structure location, loading, or elevations are changed, we request that we be advised so that we may re-evaluate our recommendations.

Determination of an appropriate foundation system for a given structure is dependent on the proposed structural loads, soil/subsurface conditions, permissible settlement, and construction constraints such as proximity to other structures, etc. The subsurface exploration aids the geotechnical engineer in determining the soil stratum appropriate for structural support. This determination includes considerations with regard to both allowable bearing capacity and compressibility of the soil strata. In addition, since the method of construction greatly affects the soils intended for structural support, consideration must be given to the implementation of suitable methods of site preparation, fill compaction, and other aspects of construction.

Based on the results of the test borings, previously placed fill soils are expected to be encountered in the majority area of the proposed building. Based on our visual observations of the samples and SPT data, fill soils are expected to be of variable composition containing variable amounts of moderately plastic materials, variable density, and may cause excessive differential settlements and heave. Therefore, previously placed fill soils within the area of the proposed building will require removal and replacement with suitable materials. Furthermore, most of the natural soils encountered in the borings have moderate to high swell potential as well. Accordingly, the natural soils in the existing condition are also not considered suitable to provide direct support of the footings/slabs.

5.2 **Foundation Design**

Based upon the results of our geotechnical study done to date, it is currently the opinion of Hillis-Carnes Engineering Associates that the proposed structure, from a geotechnical loading viewpoint, may be supported on a spread footing foundation system bearing on AASHTO No. 57 stone placed over approved materials.

All column and wall footings should bear on at least 2 feet of AASHTO No. 57 stone. The existing soils in the area of the footings should be undercut to place at least 2 feet of #57 stone underneath each footing. Any foundations supported on controlled fills should also be supported on at least 2 feet of AASHTO No. 57 stone, to minimize differential settlements.

Our current study indicates that conventional spread footing foundations bearing on 2 feet of #57 stone and constructed as per the recommendations provided in this report can be designed for a maximum net allowable soil design bearing pressure

not in excess of 2,500 pounds per square foot. To reduce the possibility of localized shear failures, column and strip footings should be a minimum of 36 inches square and 18 inches wide, respectively.

During construction, approved footing subgrades should be protected from freezing temperatures, excessive losses of natural moisture (desiccation), excessive moisture accumulation, abusive construction trafficking/equipment, and other activities or elements considered detrimental to an otherwise suitable subgrade. Spread footings that will be subjected to freezing temperatures and associated frost susceptible materials subsequent to construction should be constructed at least 30 inches below adjacent exterior grades in order to bear below normal frost depth.

For foundations situated on structural fill placed over approved materials, it is considered essential that the structural fill extend a minimum of 9 inches laterally beyond the footing perimeters for each vertical 12 inches of structural fill placed beneath the subject footing.

We consider it imperative that the footing excavations be observed and approved by a representative of Hillis-Carnes Engineering Associates directly prior to the placement of AASHTO No. 57 stone, reinforcing steel, and/or concrete. The purpose of the inspection would be to verify that the exposed materials have not been disturbed and will be capable of supporting the design bearing pressure. If soft or loose pockets are encountered in the footing excavations, the unsuitable material should be removed and replaced with AASHTO No. 57 stone, structural fill or lean concrete.

5.3 Settlement

Based on the boring data and the anticipated loading, we estimate that total geotechnical related settlements for the foundations should not exceed one inch with differential settlement expected to be about half the total settlement. The magnitude of differential settlements will be influenced by the distribution of loads and the variability of underlying bearing materials. Quality control during construction is considered to be of extreme importance to ensure that subsequent settlements, following the construction process, are kept to a minimum.

5.4 Ground-Supported Floor Slabs

The in-situ soils in the existing condition are not adequate to provide direct support of the floor slabs. It is the opinion of Hillis-Carnes Engineering Associates that the floor slabs may be designed as a slab-on-grade units supported by stone dust (#10 screenings) placed over approved materials. **All floor slabs should be supported by at least 6 inches of AASHTO No. 57 crushed stone underlain by 1 foot of stone dust (#10 screenings).** The stone dust should be compacted to 97 percent of the maximum dry density, in accordance with the Modified Proctor (ASTM D-1557).

The recommended 6-inch AASHTO No. 57 crushed stone layer beneath the floor slabs will provide a capillary break as well as improve floor slab support. The

Contractor should compact the #57 stone in place for particle interlock with at least two passes of suitable vibratory rollers. A vapor retardant should be used beneath ground floor slabs that will be covered by tile, wood, carpet, impermeable floor coatings, and/or if other moisture-sensitive equipment or materials will be in contact with the floor. However, the use of vapor retardants may result in excessive curling of floor slabs during curing. Please refer the floor slab designer to ACI 302.1R-96, Sections 8.4 and 11.11, for further discussion on vapor retardants, curling, and the means to minimize concrete shrinkage and curling.

Proper jointing of the ground floor slab is also essential to minimize cracking. ACI suggests that unreinforced, plain concrete slabs have joints at a spacing of 24 to 36 times the slab thickness, up to a maximum spacing of 18 feet. Floor slab construction should incorporate isolation joints along bearing walls and around column locations to allow minor movements to occur without damage. Utility or other construction excavations in the prepared floor subgrade should be backfilled to controlled fill criteria to provide uniform floor slab support.

Stone dust are expected to be present at the floor slab subgrades based on the proposed finished floor elevation and as per our recommendation. A subgrade modulus (k) of 150 pounds per cubic inch can be used for the floor slab design. This recommended value is based on stone dust being present below the floor slab crushed stone subbase. Once again, quality control during construction is important to ensure that the floor slab subgrade is comprised of suitable materials.

On most projects, there is a substantial time difference between the initial grading and the actual construction of the floor slab. As a result, the subgrade soils are often disturbed by seasonal conditions and construction traffic. Therefore, provisions should be included for restoring the subgrade to a stable condition prior to the construction of the floor slab. It is recommended that the structural framing and the roof system be completed prior to attempting the restoration if at all feasible. Also, a representative of Hillis-Carnes Engineering Associates should inspect the floor slab areas prior to placing the crushed stone.

5.5 International Building Code (IBC) Site Classification

Our scope of services did not include a seismic condition survey to determine site-specific shear wave velocity information. IBC 2018 provides a methodology for interpretation of Standard Penetration Test resistance values (N-values) to determine a Site Class Definition. However, this method requires averaging N-values over the top 100 feet of the subsurface profile.

We note that the test borings for this project generally encountered loose to dense residual materials. In general accordance with the 2018 IBC, a Site Classification of "D" was established for further evaluations relative to Earthquake Load design.

5.6 Pavement Recommendations

Based on our review of the provided development plans, we understand that the new school will have new asphalt paved drives and parking areas. Asphalt

pavement recommendation is provided below in Table 1. It is very important that the pavement subgrades be proofrolled under our observation. Soft soils encountered during proofrolling should be removed and replaced with new compacted fill. The surface of the pavement subgrades should be compacted to 97 percent of the maximum dry density, in accordance with the Modified Proctor (ASTM D-1557).

In order to provide design pavement sections, we have utilized a design CBR value of 5, based on the CBR test performed on the bulk samples collected from the site. **It is recommended that exposed pavement subgrades be observed, tested, and evaluated by the Geotechnical Engineer prior to paving to determine that the design CBR value is present. Furthermore, based on the borings performed within the proposed pavement areas, we expect that the exposed subgrade will generally consist of previously placed fill soils or moderately plastic clayey soils. Accordingly, over-excavation and replacement with suitable controlled fills meeting below structural fill classification criteria will be required. We recommend that the plastic soils should be kept at least 2 feet below the pavement subgrade.**

The following pavement section with a graded aggregate may be desirable, as shown below.

Table 1 – Pavement Section

Pavement Material	Thickness
Asphalt Concrete	6"
Graded Aggregate Base	8"
Approved Subgrade	

The recommended pavement section is not intended to accommodate construction traffic. If the asphalt base course is placed prior to the substantial completion of the project, portions of the asphalt should be expected to be damaged and require replacement prior to the placement of the surface course. Pavement subgrade preparation and paving should be performed during the dryer portions of the year, typically June to October. Pavement edge drains may be required at low areas where water may accumulate within the graded aggregate base.

All structural fill below pavements should be placed in horizontal loose lifts not in excess of 8 inches thick and compacted to at least 92 percent of the maximum dry density as determined by the Modified Proctor (ASTM D-1557). However, the pavement subgrade should be compacted to at least 97 percent per same standard. The moisture content of the fill should be maintained within 2% of the optimum moisture content as determined by ASTM D-1557. Soils used as structural fill should be classified as silty SAND or better and should have a liquid

limit less than 40, a plasticity index less than 12 and should have a maximum dry density of no less than 110 pcf.

6.0 IN-SITU INFILTRATION TESTING

The primary criteria for a site to be deemed suitable for infiltration practices are:

1. Bedrock must be deeper than 4 feet below the bottom of the infiltration.
2. Typical groundwater levels must be deeper than 4 feet below the bottom of the infiltration facility.
3. Infiltration must take place in natural ground.
4. The natural soils below the placed infiltration media must be capable of sustaining a minimum infiltration rate of 0.52 inches per hour over the course of a four-hour field infiltration test.

All six SWM borings tested for infiltration (SWM-1, SWM-4, SWM-6, SWM-8, SWM-10 and SWM-11) met the first three criteria. PVC pipes were placed approximately at a depth of 8 feet in the offset drilled locations of these borings. The pipes were gently tapped to seat it into the base of the boring. The annular space was backfilled with soil material. Subsequent to the installation, a minimum 24-inch head of water was added to each PVC pipe at completion of the installation for pre-soak purposes. The in-situ infiltration testing was conducted following the pre-soak period. To comply with Maryland Department of the Environment requirements, a laboratory-testing program consisting of moisture content determinations and classification (Hydrometer and gradation) testing was conducted. The laboratory test results and the field infiltration test results for the locations tested are included in Appendix D and summarized below in Table 2.

Table 2 - Infiltration Summary

Test Boring No.	Surface Elevation (ft)	Test Depth Below Existing Grade ft (Elev.)	USDA Classification	Infiltration Rate (in/hr)
SWM-1	410.3+/-	8 (402.3)	CLAY	0.05
SWM-4	412.5+/-	8 (404.5)	SANDY CLAY LOAM	0.45
SWM-6	400+/-	8 (392)	SANDY CLAY LOAM	0
SWM-8	412.5+/-	8 (404.5)	CLAY	0.25
SWM-10	406.8+/-	8 (398.8)	CLAY	0.2
SWM-11	407.6+/-	8 (399.6)	CLAY	0.53

As shown below in Table 2, the measured infiltration rates in all borings, except boring SWM-11, was less than 0.52 in/hr. Therefore, the site located in the area of boring SWM-11 is the only area that is deemed to be suitable for infiltration practices. The remaining proposed sites at the tested depths are not suitable for infiltration practices.

7.0 CONSTRUCTION RECOMMENDATIONS

7.1 Site Preparation

Before proceeding with construction, the existing structures should be demolished and organic materials and other deleterious non-soil materials (if present) should be stripped and/or removed from the proposed construction areas. Then the existing soils should be undercut to allow placing of the recommended crushed stone and stone dust. During the clearing and stripping operations, positive surface drainage should be maintained to prevent the accumulation of water. Existing underground utilities, if present, should be re-routed to locations a suitable distance outside of the proposed structure footprints.

A geotechnical engineer should evaluate the exposed subgrade. At that time, the engineer should require proofrolling of the subgrade with a 20-ton payload dump truck or other pneumatic-tired vehicle of similar size and weight. Proofrolling should be performed during an interval of acceptable weather conditions and not while the site is wet, frozen, or severely desiccated. The purpose of the proofrolling would be to locate soft, weak, or excessively wet soils present at the time of construction.

Particular attention should be given to existing utility trenches, if present within the proposed construction limits. Our experience is that utility trenches are sometimes backfilled with very little compactive effort. Accordingly, the utilities and the associated backfill should be removed during the initial phase of the construction process. Where utility lines are removed, the trench subgrade should be verified by a representative of Hillis-Carnes Engineering Associates prior to backfilling in accordance with the controlled structural fill recommendations provided in this report.

The proofrolling observation is an opportunity for the geotechnical engineer to locate inconsistencies intermediate of our boring locations in the existing subgrade. Geotechnical engineer should evaluate any remaining fill soils to determine the suitability to remain in-place, need for over-excavation, or in-place stabilization. Any unsuitable materials observed during the evaluation and proofrolling operations should be undercut and replaced with compacted fill or stabilized in-place. The possible need for, and extent of, undercutting and/or in-place stabilization required can best be determined by the geotechnical engineer at the time of construction. Once the site has been properly prepared, the construction process may proceed.

The action of heavy equipment may very well create pumping and a general deterioration of the soils. This may especially be applicable if the work is conducted in the presence of high moisture contents. This situation could impede the progress of the construction activities and/or necessitate the implementation of remedial work to permit the construction process to continue. If such problems arise, the geotechnical engineer should be consulted for an evaluation of the conditions.

7.2 Foundation Construction

All foundation subgrades should be observed, evaluated, and verified for the design bearing pressure by the geotechnical engineer after excavation and prior to

reinforcement steel placement. If relatively deep or soft fill are encountered during foundation construction, localized undercutting and/or in-place stabilization of foundation subgrades will be required. The actual need for, and extent of, undercutting should be based on field observations made by the geotechnical engineer at the time of construction.

Excavations for footings should be made in such a way so as to provide bearing surfaces that are firm, level, and free of loose, soft, wet, or otherwise unsuitable soils. Foundation concrete should not be placed on frozen or saturated subgrades. If such materials are allowed to remain below foundations, settlements magnitudes will increase. Foundation excavations should be concreted as soon as practical after they are excavated. If an excavation is left open for an extended period, a thin mat of lean concrete should be placed over the bottom to minimize damage to the bearing surface from weather or construction activities. Water should not be allowed to pond in any excavation.

7.3 Controlled Structural Fill

If controlled structural fill is required, it may be constructed using approved non-organic on-site soils or an approved off-site borrow material. Most of the on-site soils have moderate to high swell potential and are not considered to be suitable to be used as a controlled structural fill. Therefore, the majority of the controlled structural fill materials should be imported from an approved off-site borrow source. Any fill imported from off site should be free of debris and organic material. It should have a Liquid Limit less than 40 and a Plasticity Index less than 12. The moisture content of the fill should be within three percentage points of the optimum moisture content as determined by the modified Proctor density test or drier, if necessary, so as to attain proper compaction. This may require the contractor to dry soils during wet weather or add water during dry, hot weather. The geotechnical engineer should individually evaluate structural fill material. Based on the lab test results, selective on-site materials are expected to meet these controlled fill specifications.

Controlled structural fill should be free of boulders, organic matter, debris, or other deleterious materials and should have a maximum particle size no greater than 4 inches. In addition, we recommend a minimum modified Proctor (ASTM D 1557) maximum dry density of 110 pounds per cubic feet for fill materials.

It is not anticipated that some material larger than the specified 4 inches will be encountered, but if it is, such material should not be used for utility trench or foundation backfill but may be suitable for initial portions of the site in the deeper fill areas in green or parking lot areas. More specific determinations can best be made in the field after assessing the site-specific situation. The material should be enveloped with filter fabric or 'choked off' with graded aggregate prior to overlaying the stone with soil material. Also, the material should not be used in the upper 12 inches of the pavement/floor slab subgrade as grading difficulty will result.

Fill materials should be placed in horizontal lifts with maximum height of 8 inches loose measure. New fill should be adequately keyed into stripped and scarified subgrade soils and should, where applicable, be properly benched into existing slopes or laid-back portions of excavations. During fill operations, positive surface

drainage should be maintained to prevent the accumulation of water. We recommend that structural fill be compacted to at least 92 percent of the modified Proctor maximum dry density. In confined areas such as utility trenches and foundation walls, portable compaction equipment and thinner lifts of 3 to 4 inches may be required to achieve adequate degrees of compaction.

We recommend that the contractor have equipment on site during earthwork for both drying and wetting of the soils as moisture alterations could very well be necessary at the time of construction. Moisture control may be especially difficult during winter months or extended periods of rain. Attempts to work the soils when wet can be expected to result in deterioration of otherwise suitable soil conditions of previously placed and properly compacted fill.

Where construction traffic or weather has disturbed the subgrade, the affected soils intended for structural support should be scarified and re-compacted. Each lift of fill should be tested in order to confirm that the recommended degree of compaction is attained. Field density tests to verify fill compaction should be performed for every 5000 square feet (approximately 70 feet square) of fill area, with a minimum of two tests per lift.

7.4 Subsurface Water Conditions and Site Drainage

Subsurface water for the purposes of this report is defined as water encountered below the existing ground surface. Based on the subsurface water data obtained during our exploration program and the proposed construction, subsurface water is not anticipated during the anticipated earthwork, shallow foundation excavations and is estimated to occur below foundation levels. Of course, fluctuations in subsurface water levels and soil moisture can be anticipated with seasonal changes, as well as changes in precipitation amounts and rainfall runoff characteristics.

It is considered essential that adequate drainage is provided at the site at all times to minimize any increase in moisture content of the subsurface materials. This is considered to be critical for paved areas due to the potential loss of subgrade strength, freeze thaw activity of the soils, and potential dissolution related activity. All areas should be sloped away from the structure to prevent the collection of water around the building. The site drainage should also be such that the run-off onto adjacent properties is properly controlled. Gutters, downspouts and planter areas should be properly designed and maintained so that water is routed away from the various facilities and into the storm drain system.

7.5 Rock Excavation

Based on the test borings results, excavations for the foundations, storm drain, and other utilities are not expected to encounter disintegrated rock. We note that geotechnical drilling equipment used in our exploration is sometimes capable of penetrating material that would not be rippable using conventional excavating equipment. We recommend that an air-track investigation be performed along the proposed utilities, once the invert grades are determined, to create a profile of the rock surface.

Rock excavation quantities are frequently an issue of contention; therefore, the following definition of rock is provided for general use at this site. Rock is defined as any material which cannot be dislodged by a Caterpillar D-8 tractor with a hydraulic ripper (or a Caterpillar 235 excavator with a rock bucket), or equivalent, without the use of blasting. Excavation of boulders or masses of rock exceeding one cubic yard in volume should also be considered rock excavation.

We recommend an unclassified earthwork specification. The unclassified excavation pays for any and all excavation on either a lump sum or single unit price basis. Minimal record keeping is required for the unclassified specification; however, the contractor assumes much of the risk for variability in subsurface conditions and may result in an increased cost contingency in the bid. The unclassified classification is appropriate if an upfront excavation cost is desired. Alternatively, the classified Rock excavation specification pays for Rock excavation on a unit rate basis.

7.6 Construction in Expansive Soils

The following information has been assimilated after examination of numerous projects constructed in active soils. Majority of the soils encountered at this site are considered to have moderate to high swell potential. If these features are incorporated into the overall design of the project, the performance of the structures should be improved.

- Special considerations should be given to completion items outside the structure area, such as stairs, sidewalks, etc. They should be designed to adequately sustain potential vertical movements.
- The general ground surface should be sloped away from the structure on all sides so that water will always drain away from the structure. Water should not be allowed to pond near the structure after the slab and/or foundation has been placed.
- Roof drainage should be collected by a system of gutters and downspouts and transmitted by pipe to a storm drainage system where the water can drain away without entering the building subgrade.
- Sidewalks should not be structurally connected to the structure. They should be sloped away from the structure so that surface water will drain away.
- Sprinkler lines and sprinkler heads, if used, should not be placed alongside the sidewalls of the structure, but should be placed away from the structure such that the water will be sprayed towards the structure. The purpose of this recommendation is to mitigate the ponding and subsequent percolation of water into the soils beneath the structure causing detrimental vertical movements in the event that a sprinkler line or sprinkler head ruptures.
- Utilities that project through the slabs on grade should be designed with either some degree of flexibility or with sleeves. Such design features will help to reduce the risk of damage to the utility lines as vertical movements occur.
- Backfill for utility lines or along grade beams should consist of onsite material. If the backfill is too dense or dry, swelling may form a mound along the ditch line. The soils should be processed through the previously discussed compaction criteria. If non-plastic soil is used for bedding, a clay plug should

be constructed at the slab on grade face to diminish access to the interior of the slab from percolating water transmitted through the bedding material.

- During construction, every attempt should be made to limit the extreme wetting or drying of the subsurface soils since swelling or shrinkage will result. Standard construction practices of providing surface water drainage should be used. A positive slope of the ground away from the foundations and select fill excavations and ditches is recommended along with ditches or swales provided to carry off the runoff water both during and after construction.

8.0 CONTINUATION OF SERVICES

Additional construction related services recommended for the project are as follows:

General Reviews

It is recommended that Hillis-Carnes Engineering Associates be given the opportunity to review the various design information, drawings, and specifications as the design process advances. This review evaluates whether the recommendations and comments provided herein are appropriate and have been understood and properly implemented.

Site Preparation

The geotechnical engineer should observe the site after it has been stripped and excavated. The individual should determine if any precautionary measures, undercutting, and/or or in-place densification is necessary to prepare a subgrade for structural fill placement, foundation construction and floor slab construction, and pavement construction.

Fill Placement and Compaction

The geotechnical engineer should witness any required fill operations and should verify that an adequate degree of compaction is achieved. The individual should observe and approve all on-site or borrow materials used and should determine if they are suitable.

Foundation Excavations

The geotechnical engineer should observe the various excavations for the project. He should verify that the design bearing pressure is available and that no loose or soft areas exist directly beneath the bearing surfaces of the excavations.

9.0 LIMITATIONS

This report has been prepared for the exclusive use of the project site. Our services were performed in accordance with contemporary soil and foundation engineering practices. No warranty, either expressed or implied, is made. Our conclusions and recommendations are based on design information furnished to us, the data obtained from the previously described subsurface exploration program, and current geotechnical engineering practice. The findings and recommendations do not reflect variations in subsurface conditions that could exist between the boring locations or in unexplored areas of the site. Should such variations become apparent during

construction, it will be necessary to re-evaluate our conclusions and recommendations based upon on-site observations of the conditions.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions in other areas will differ from those at the boring locations and the conditions may not be as anticipated by the designers. Additionally, the construction process may alter the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork and foundation construction to the extent feasible to verify that the conditions anticipated in design actually exist in the field at the time of construction. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the design or location of the proposed structure, the recommendations presented in the report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified and/or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

It is important to note that our study was done in an effort to assist planning and design personnel in the preparation of generalized drawings and specifications for the project. As a result of this, potential contractors should be encouraged to conduct their own individually tailored studies to assess surface conditions, soil types and conditions, rock levels and conditions, excavation slope gradients, and ground water/perched water levels and conditions. Specifically, our report has been prepared for generalized information for planning and design purposes not for bid preparation purposes.

APPENDIX

Appendix A

Drawing 1: Site Vicinity Plan

Drawing 2: Site Location Plan

Appendix B

Drawing 3: Boring Location Plan

Records of Soil Exploration (Test Boring Logs)

General Notes for Subsurface Records

Soil Identification Sheet

Appendix C

Drawing 4: Site Geological Excerpt

Drawing 5: Site Aerial

Appendix D

Laboratory Results

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

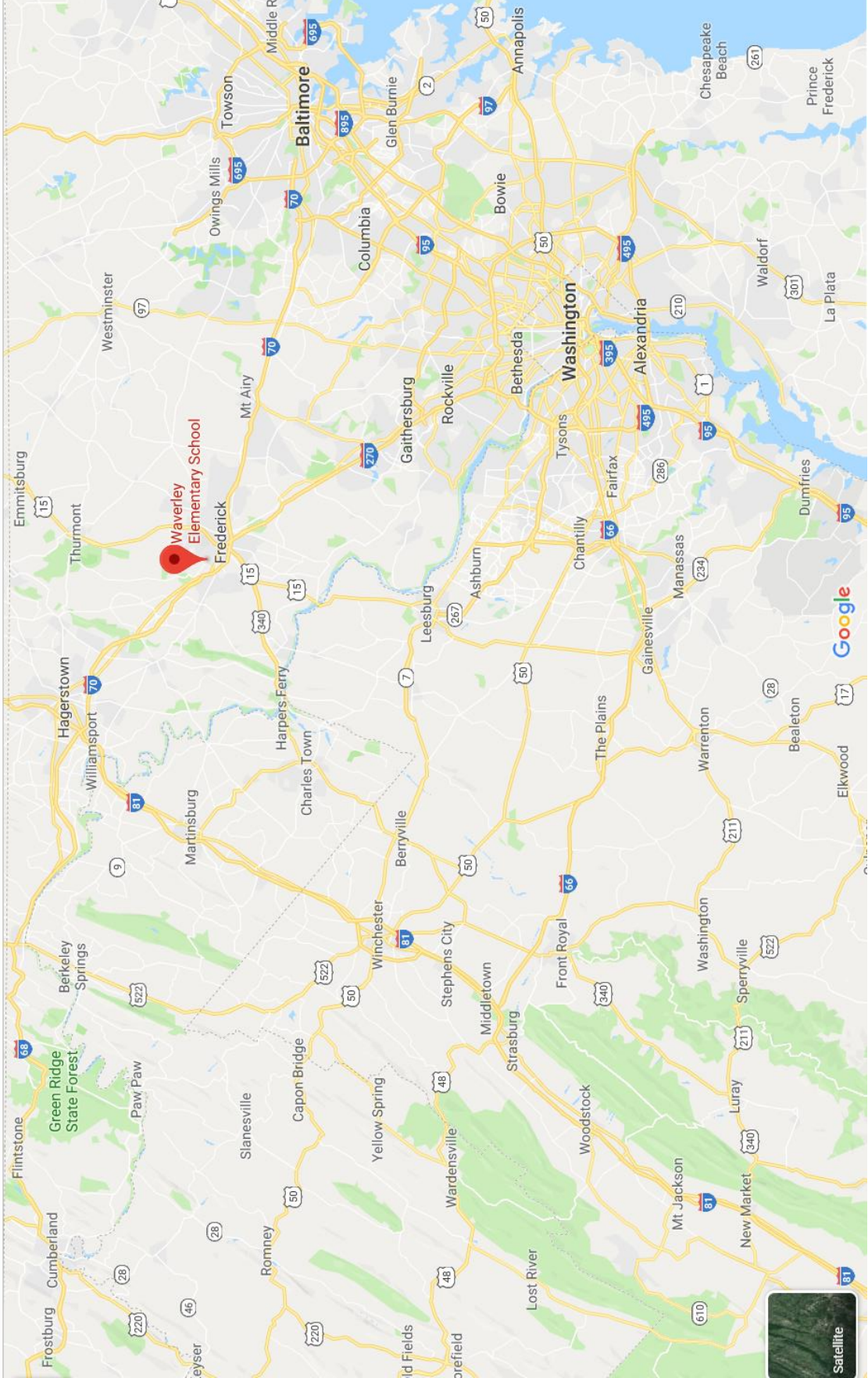
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



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HILLIS-CARNES
Engineering Associates, Inc.

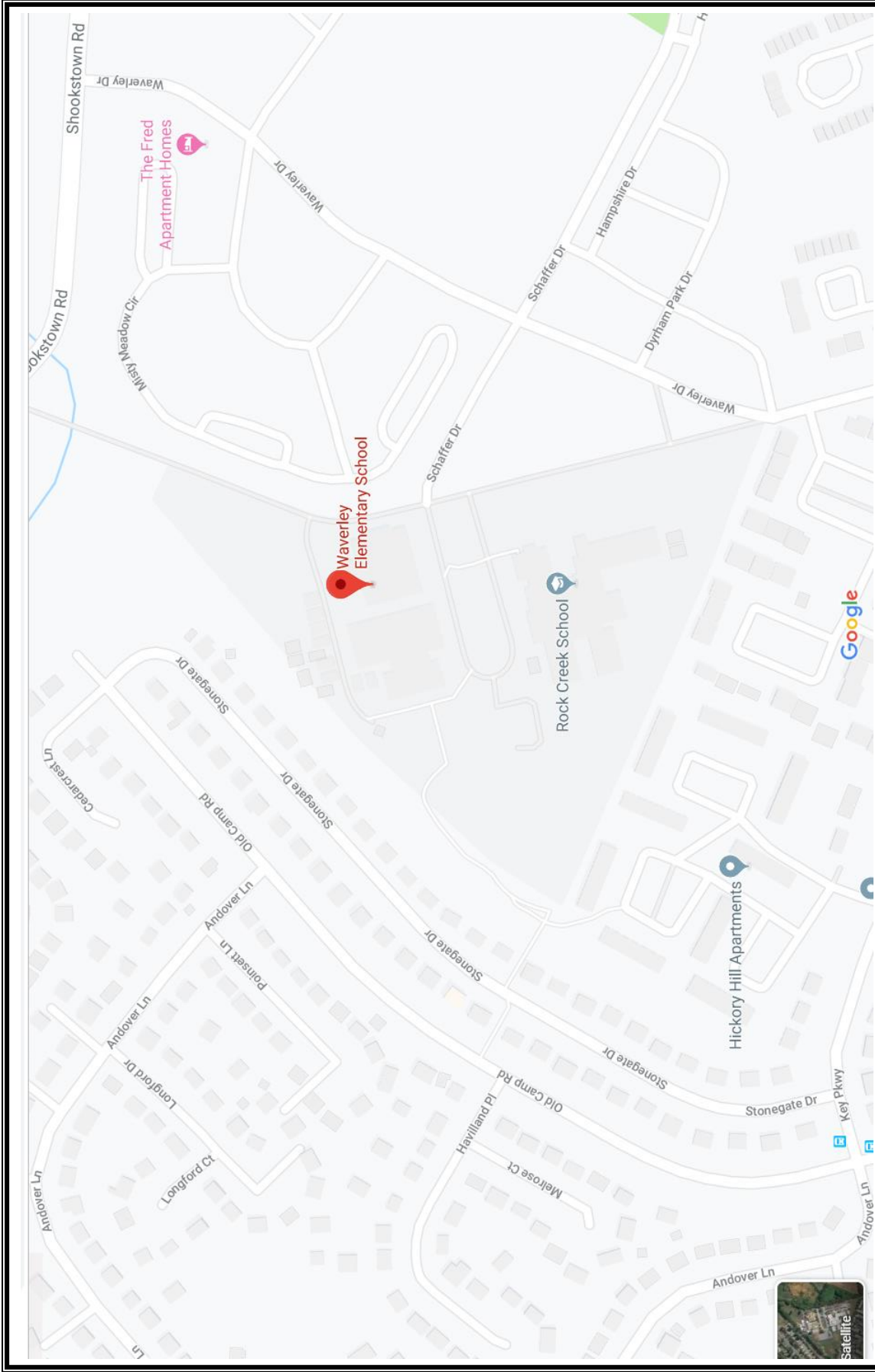
PROJECT NO.: 19418A

SCALE: NTS

DATE: September 23, 2019

Site Vicinity, Waverley Elementary School – Frederick, MD

DRAWING NO.
1



HILLIS-CARNES
Engineering Associates, Inc.

PROJECT NO.: 19418A

SCALE: NTS

DATE: September 23, 2019

Site Location, Waverley Elementary School – Frederick, MD

DRAWING NO.
2

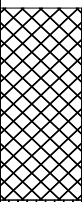
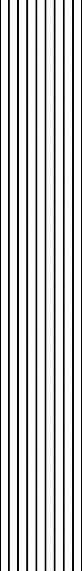
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-1
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	CURVE		
								10	30	50
0		Dark brown sandy lean CLAY with gravel, with trace of organic, dry, very stiff, (Probable FILL as CL)	4" topsoil	15		5-12-11	23			
405		Dark reddish brown sandy lean CLAY, with trace of organic, moist, medium stiff, (Probable FILL as CL)		8		3-4-3	7			
5		Dark grayish brown and brown SILT with sand, moist, medium stiff, (ML-Natural)		18		2-2-3	5			
400		Light brown with trace of gray SILT with sand, moist, stiff, (ML)		18		3-5-9	14			
10										
395		- very stiff		12		8-11-12	23			
15										
390				18		8-11-12	23			
20										
385										
25			End of boring at 20 feet below grade.							
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14.5 ft.
14.5 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

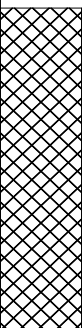



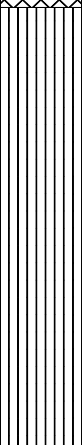


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-2
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 409.7 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot	
							N	CURVE
								10 30 50
0		Dark brown sandy lean CLAY with gravel, with trace of organic, dry, very stiff, (Probable FILL as CL) - dark reddish brown, stiff	4" topsoil	12		8-11-11	22	
405		Red with brown sandy lean CLAY, with trace of rock fragments, moist, stiff, (Probable FILL as CL)		8		5-6-6	12	
				15		3-6-7	13	
400			Brown, red and gray SILT with sand, with trace of rock fragments, moist, very stiff, (ML-Natural)		18		3-7-12	19
395				18		5-7-9	16	
390				18		7-9-10	19	
385								
380			End of boring at 20 feet below grade.					

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14.4 ft.
12 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-3
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 410.3 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
410 0		Dark reddish brown clayey SAND with gravel, moist, medium dense, (Probable FILL as SC)	4" topsoil	15		4-5-11	16			
		Reddish brown sandy lean CLAY with rock fragments, moist, very stiff, (Probable FILL as CL)		15		6-7-9	16			
405 5		Dark reddish brown clayey SAND with rock fragments, with trace of organic, moist, medium dense, (Probable FILL as SC)		8		1-5-7	12			
		Brown with red sandy lean CLAY with rock fragments, moist, stiff, (CL-Natural)		18		3-4-6	10			
400 10		- very stiff		18		4-7-9	16			
395 15				18		6-7-10	17			
390 20			End of boring at 20 feet below grade.							
385 25										
380 30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
15.6 ft.
14.6 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-4
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 411.1 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0										
410		Dark reddish brown clayey SAND with gravel, with organic, dry, medium dense, (Probable FILL as SC)	4" topsoil	11		12-10-8	18			
				15		5-7-9	16			
5		Dark red with light brown sandy Fat CLAY with rock fragments, moist, very stiff, (CH-Natural)		8		5-8-10	18			
		- stiff		18		5-6-9	15			
10										
400		- very stiff		11		5-7-9	16			
15										
395				18		9-9-10	19			
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
14.8 ft.
14 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

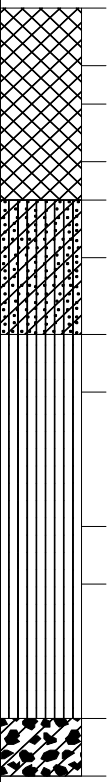
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-5
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 410.2 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot	
							N	CURVE
410 0		Brown sandy lean CLAY, with trace of gravel, moist, stiff, (Probable FILL as CL) - very stiff	2" Asphalt Concrete 3" Aggregate Base	18		2-5-6	11	10 30 50
405 5		Dark reddish brown silty clayey SAND with rock fragments, moist, medium dense, (SC-SM Natural)		5		5-10-15	25	
400 10		Brown with black, sandy lean CLAY, with trace of rock fragments, moist, medium stiff, (CL)		18		3-8-13	21	
395 15		Brown with reddish brown sandy SILT with rock fragments, moist, loose, (ML)		18		2-3-5	8	
390 20		Reddish brown with trace of brown and gray clayey ROCK fragments with sand, moist, loose, (GC)		5		3-4-5	9	
385 25			18		3-3-5	8		
380 30								

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
13.5 ft.
11.8 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

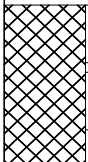
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-6
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.2 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
405		Dark brown sandy lean CLAY with gravel, with organic, dry, very stiff, (Probable FILL as CL) - reddish brown, with organic and asphalt debris, stiff	3" topsoil	14		5-9-8	17			
5				12		4-4-5	9			
400		Dusky red with light brown sandy Fat CLAY, with trace of rock fragments, moist, very stiff, (CH-Natural)		15		3-12-11	23			
10				18		5-9-11	20			
395				Dark red, brown and gray SILT with sand, with trace of rock fragments, moist, medium dense, (ML-Natural)	18		3-7-12	19		
15	End of boring at 20 feet below grade.	18			5-6-9	15				
390										
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14.3 ft.
13 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

RECORD OF SOIL EXPLORATION

SAMPLER									
Datum	<u>MSL</u>	Hammer Wt.	<u>140</u>	lbs.	Hole Diameter	<u>3 1/4 in.</u>	Foreman	<u>Viktor</u>	
Surf. Elev.	<u>410</u>	Ft.	Hammer Drop	<u>30</u>	in.	Rock Core Diameter	<u>NA</u>	Inspector	<u>Robel Gibbe</u>
Date Started	<u>08/05/2019</u>	Pipe Size	<u>2 O.D.</u>	in.	Boring Method	<u>HSA-SPT</u>	Date Completed	<u>08/05/2019</u>	

SAMPLER TYPE	SAMPLE CONDITIONS		SHOULDER WATER	SOIL DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>15</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>13.2</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

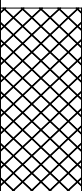


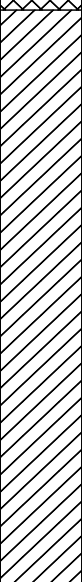




HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-8
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown clayey SAND with gravel, with organic, dry, medium dense, (Probable FILL as SC)	4" topsoil	15		4-7-8	15			
405		Dark brown sandy lean CLAY with rock fragments, with organic, moist, very stiff, (Probable FILL as CL)		16		6-10-8	18			
5		Brown sandy lean CLAY, moist, stiff, (CL-Natural)		17		4-5-6	11			
400				16		5-7-8	15			
395		- reddish brown and light brown, with trace of rock fragments, very stiff		16		11-13-11	24			
390		- stiff		5		4-7-8	15			
20			End of boring at 20 feet below grade.							
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

**GROUND
WATER**
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

**CAVE IN
DEPTH**
13.7 ft.
13.3 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

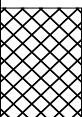





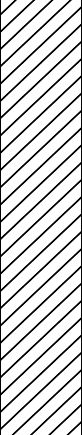


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-9
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.3 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark reddish brown sandy lean CLAY, with trace of rock fragments, dry, very stiff, (Probable FILL as CL)	4" topsoil	18		6-8-8	16			
405		Reddish brown clayey SAND with rock fragments, dry, medium dense, (Probable FILL as SC)		15		11-13-15	28			
5		Reddish brown clayey ROCK fragments with sand, moist, loose, (GC-Natural)		16		3-4-6	10			
400		Brown sandy lean CLAY, with trace of rock fragments, moist, stiff, (CL)		16		4-6-7	13			
10		- very stiff		16		4-7-9	16			
395										
15		- stiff		18		4-5-7	12			
390			End of boring at 20 feet below grade.							
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
13.8 ft.
13.4 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING









HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-10
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark reddish brown silty ROCK fragments, with organic, dry, loose, (Probable FILL as GM)	3" topsoil	2		1-3-6	9			
405		Brown with black Fat CLAY with sand, moist, medium stiff, (CH-Natural)		11		3-5-3	8			
5		- with rock fragments, very stiff		15		5-10-18	28			
400		- brown, reddish brown and black, stiff		18		3-5-10	15			
10										
395				18		3-6-9	15			
390										
20			End of boring at 20 feet below grade.	18		4-7-8	15			
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
13.8 ft.
13.4 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING







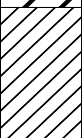

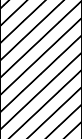

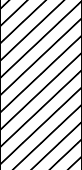

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-11
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot	
							N	CURVE
								10 30 50
0		Dark brown sandy lean CLAY with gravel, dry, very stiff, (Probable FILL as CL)	3" topsoil	12		6-12-12	24	
405		Brown with black sandy SILT, moist, medium stiff, (ML-Natural)		18		4-4-5	9	
5		Brown with black Fat CLAY with sand, moist, medium stiff, (CH)		18		2-3-5	8	
400		Brown sandy lean CLAY, moist, stiff, (CL)		18		3-6-8	14	
10								
395		Light brown lean CLAY with sand, moist, stiff, (CL)		18		3-4-6	10	
15								
390		- with dark brown		18		4-6-7	13	
20			End of boring at 20 feet below grade.					
385								
25								
380								
30								

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
13.7 ft.
13.4 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

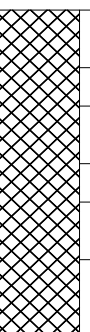
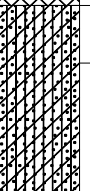

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-12
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot CURVE			
							N	10	30	50
0		Reddish brown sandy lean CLAY, moist, medium stiff, (Probable FILL as CL) - dark brown, with organic, very stiff	3" topsoil	18		2-3-4	7			
405		- medium stiff		6		4-7-9	16			
5				18		3-5-3	8			
400		Reddish brown silty clayey SAND with rock fragments, moist, medium dense, (SC-SM Natural)	End of boring at 20 feet below grade.	6		6-6-9	15			
10										
395		Dusky red with light brown sandy Fat CLAY, with trace of rock fragments, moist, very stiff, (CH) - stiff		18		6-7-9	16			
15										
390				18		3-5-7	12			
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

**GROUND
WATER**
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

**CAVE IN
DEPTH**
13.9 ft.
13.5 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

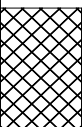



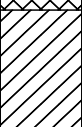




HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-13
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Reddish brown lean CLAY with sand, with trace of rock fragments, moist, medium stiff, (Probable FILL as CL)	4" topsoil	12		3-4-4	8			
405		Brown sandy lean CLAY with rock fragments, with organic, moist, stiff, (Probable FILL as CL)		15		5-7-8	15			
5		Brown with black sandy lean CLAY, moist, stiff, (CL-Natural)		16		4-5-6	11			
400				18		4-5-8	13			
10										
395		Brown with dusky red sandy Fat CLAY, moist, stiff, (CH)	14		3-4-5	9				
15										
390			18		3-4-8	12				
20			End of boring at 20 feet below grade.							
385										
25										
380										
30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
13.3 ft.
13 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

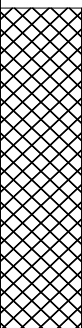



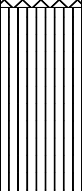




HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-14
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/12/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/12/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown sandy lean CLAY with gravel, dry, stiff, (Probable FILL as CL) - dark brown, moist	4" topsoil	8		2-7-7	14			
405				14		5-5-7	12			
5		- brown, with organic, dry		2		4-5-7	12			
400		Reddish brown and light brown sandy SILT, moist, medium dense, (ML-Natural)		15		4-5-7	12			
10										
395		Brown, reddish brown and black Fat CLAY with sand, moist, stiff, (CH)		15		3-4-5	9			
15										
390			End of boring at 20 feet below grade.	17		3-5-6	11			
20										
385										
25										
380										
30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
10 ft.
9 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

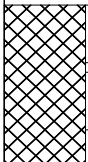
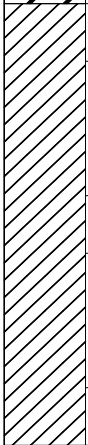
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-15
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 409.7 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/12/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/12/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
405 5		Light reddish brown Fat CLAY with sand, moist, medium stiff, (Probable FILL as CH)	6" Asphalt Concrete 2" Aggregate Base	13		3-3-5	8	●		
		6			3-2-4	6	●			
		12			2-6-6	12		●		
		13			4-6-7	13		●		
		9			7-9-7	16		●		
395 15		- very stiff								
390 20		- damp, medium stiff	End of boring at 20 feet below grade.	15		4-4-4	8	●		
385 25										
380 30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
11 ft.
11 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-16
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 410.6 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/15/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/15/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
410		Dark brown sandy lean CLAY with gravel, dry, medium stiff, (Probable FILL as CL)	3" topsoil	11		3-6-4	10			
		Reddish brown sandy lean CLAY with rock fragments, moist, stiff, (Probable FILL as CL)		15		3-4-6	10			
405		Brown with black Fat CLAY with sand, moist, medium stiff, (CH-Natural)		15		2-3-5	8			
		- brown and dusky red with black, stiff		15		3-4-9	13			
400		- dusky red with light brown		15		4-5-6	11			
395		- very stiff		17		3-6-12	18			
390			End of boring at 20 feet below grade.							
385										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
11 ft.
10.8 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-17
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 411.6 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0										
410		Dark grayish brown lean CLAY with sand, moist, stiff, (Probable FILL as CL)	3" Asphalt Concrete 3" Aggregate Base	18		3-5-8	13			
		Dark grayish brown with reddish brown lean CLAY with sand, moist, medium stiff, (Probable FILL as CL) - soft		18		2-2-3	5			
5				7		1-2-2	4			
405										
		Brown Fat CLAY with sand, with trace of rock fragments, moist, stiff, (CH-Natural)		18		3-5-5	10			
10										
400		- reddish brown		18		8-6-5	11			
15										
395										
		Dusky red sandy SILT, with trace of rock fragments, moist, medium dense, (ML)	End of boring at 20 feet below grade.	11		3-5-6	11			
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

**GROUND
WATER**
Dry ft.
Dry ft.
 _____ ft.

**CAVE IN
DEPTH**
13 ft.
9.7 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING



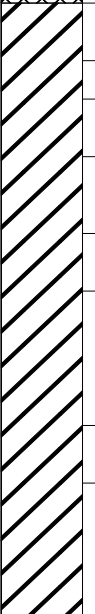






HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-18
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 412.2 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Reddish brown sandy lean CLAY, with asphalt debris, moist, medium stiff, (Probable FILL as CL)	3" Asphalt Concrete 3" Aggregate Base	3		3-4-3	7			
410		Light reddish brown sandy Fat CLAY, moist, medium stiff, (CH- Natural) - stiff		10		3-4-4	8			
5				18		3-5-6	11			
405				18		3-4-8	12			
10				18		6-12-17	29			
400		Reddish brown Fat CLAY with sand, with trace of rock fragments, moist, very stiff, (CH)								
15				18		6-10-10	20			
395		Brown sandy lean CLAY with rock fragments, moist, very stiff, (CL)	End of boring at 20 feet below grade.	18						
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 ft.

CAVE IN DEPTH
14.5 ft.
12.9 ft.
 ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-19
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 412.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot CURVE			
							N	10	30	50
0		Dusky red with dark brown sandy lean CLAY with rock fragments, moist, very stiff, (Probable FILL as CL)	2" Asphalt Concrete 4" Aggregate Base	10		3-7-10	17			
410		- dark grayish brown, soft		9		3-2-2	4			
5		Light brown, brown and reddish brown sandy lean CLAY, moist, stiff, (Probable FILL as CL)		18		3-4-5	9			
405		Dark brown sandy lean CLAY with rock fragments, with asphalt debris, moist, very stiff, (Probable FILL as CL)		3		5-8-12	20			
10		Dark reddish brown sandy SILT, moist, loose, (ML-Natural)	End of boring at 20 feet below grade.	18		3-4-4	8			
400		- medium dense		18		4-5-6	11			
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14 ft.
9.8 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING



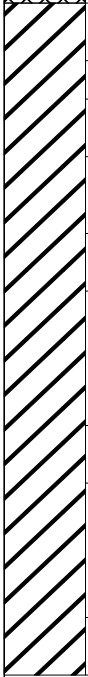





HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-20
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark brown sandy lean CLAY with gravel, with trace of organic, dry, stiff, (Probable FILL as CL)	3" topsoil	10		4-7-8	15			
410		Brown with black Fat CLAY with sand, moist, stiff, (CH-Natural)		17		6-5-9	14			
5		Brown and dusky red sandy Fat CLAY, with trace of rock fragments, moist, very stiff, (CH)		15		3-6-11	17			
405		- dusky red with light brown, stiff		17		2-4-8	12			
10										
400				15		4-6-7	13			
15										
395				17		3-6-9	15			
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
10.7 ft.
10.7 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

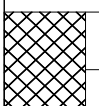

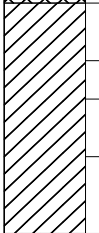


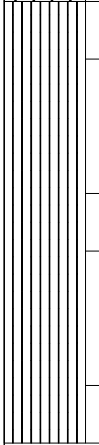



HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-21
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 412 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark reddish brown sandy lean CLAY, with trace of organic, dry, stiff, (Probable FILL as CL)	3" topsoil	10		5-6-7	13			
410		Dark reddish brown with light brown sandy lean CLAY, moist, stiff, (CL-Natural)		15		6-7-8	15			
5				15		3-4-7	11			
405										
10		Dusky red with light brown sandy SILT, with trace of rock fragments, moist, stiff, (ML)		15		3-4-8	12			
400										
15				4		3-5-7	12			
395										
20			End of boring at 20 feet below grade.	4		4-6-7	13			
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
11 ft.
10.8 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

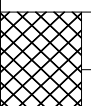
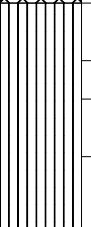
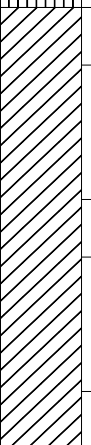
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-22
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 413.2 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Red lean CLAY with sand, moist, stiff, (Probable FILL as CL)	10" mulch	18		3-4-5	9	•		
410		Dusky red with light brown sandy SILT, with trace of rock fragments, moist, stiff, (ML-Natural)		18		3-4-5	9	•		
5				18		4-6-8	14	•		
405		Brown, dark red and gray lean CLAY with sand, moist, stiff, (CL)		18		5-4-7	11	•		
10										
400		- very stiff		18		2-6-10	16	•		
15										
395		- with rock fragments		15		17-10-8	18	•		
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. _____ ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
15.2 ft.
 _____ ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING
















HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-23
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 412.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
410		Reddish brown and brown silty clayey SAND with rock fragments, moist, medium dense, (Probable FILL as SC-SM)	4" Asphalt Concrete 5" Aggregate Base	13		4-5-8	13			
				16		5-5-7	12			
5		Reddish brown sandy SILT with trace of rock fragments, moist, medium dense, (ML-Natural)		12		3-7-8	15			
405		Dusky red sandy Fat CLAY, moist, stiff, (CH) - with light brown		15		4-4-7	11			
10										
400				18		5-5-8	13			
15										
395				18		5-5-7	12			
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14 ft.
8.3 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-24
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 411.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark reddish brown sandy lean CLAY with rock fragments, dry, very stiff, (Probable FILL as CL)	3" topsoil	18		7-9-14	23			
410		Reddish brown clayey ROCK fragments, moist, medium dense, (GC-Natural)		15		12-14-7	21			
5		Reddish brown silty ROCK fragments with sand, moist, medium dense, (GM)		12		5-6-7	13			
405		Reddish brown clayey ROCK fragments, moist, medium dense, (GC)		11		5-7-8	15			
10		Dusky red with light brown sandy SILT, with trace of rock fragments, moist, very stiff, (ML)		18		6-7-9	16			
395		Reddish brown and brown silty clayey SAND with rock fragments, moist, medium dense, (SC-SM)		15		8-7-11	18			
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
14.6 ft.
14 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-25
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 411.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/12/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/12/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0			3" topsoil	7		3-8-8	16			
410		Brown sandy lean CLAY with gravel, with trace of organic, dry, very stiff, (Probable FILL as CL) - soft		8		3-2-1	3			
5		- stiff		2		4-6-7	13			
405										
10		Dusky red sandy Fat CLAY with rock fragments, moist, stiff, (CH-Natural)		15		3-5-7	12			
400		- light brown with reddish brown								
15				15		3-7-8	15			
395										
20		Dusky red with light brown SILT with sand, moist, medium dense, (ML)	End of boring at 20 feet below grade.	17		5-5-8	13			
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
10 ft.
9.4 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-26
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 409.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/12/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/12/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
405 5 										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
10.8 ft.
10 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-27
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 411.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/12/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/12/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
410		Dusky red sandy Fat CLAY, moist, stiff, (CH-Natural)	6" Asphalt Concrete 2" Aggregate Base	11		4-5-7	12			
				9		4-5-6	11			
5		- medium stiff		5		2-4-4	8			
405										
		- with rock fragments, very stiff		11		6-7-9	16			
400			End of boring at 20 feet below grade.	3		9-13-13	26			
15										
395										
		Brown sandy lean CLAY, moist, stiff, (CL)		13		3-6-9	15			
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
11 ft.
10.8 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING



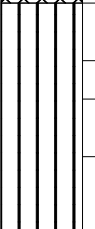


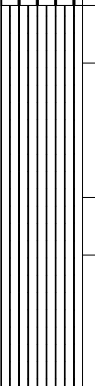




HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-28
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 411.4 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown sandy lean CLAY with gravel, dry, stiff, (Probable FILL as CL)	3" topsoil	14		4-7-8	15			
410		Light reddish brown Elastic SILT with sand, moist, stiff, (MH-Natural)		17		3-5-7	12			
5				15		3-5-6	11			
405										
10		Light brown with dusky red sandy SILT with rock fragments, moist, stiff, (ML)		18		6-8-8	16			
400										
15		- light brown with dark brown		8		6-7-8	15			
395										
20		Light brown sandy lean CLAY, with trace of rock fragments, moist, stiff, (CL)	End of boring at 20 feet below grade.	18		4-5-6	11			
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 ____ ft.

CAVE IN DEPTH
12.4 ft.
12 ft.
 ____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

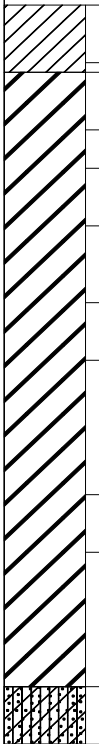

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-29
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot CURVE			
							N	10	30	50
405		Dusky red sandy lean CLAY with rock fragments, moist, stiff, (CL-Natural)	3" Asphalt Concrete 5" Aggregate Base	12		3-5-8	13	•		
405		Dusky red with light brown sandy Fat CLAY with rock fragments, moist, stiff, (CH)		14		5-6-8	14	•		
400				15		5-7-7	14	•		
400				16		4-7-8	15	•		
395		- very stiff		16		4-8-9	17	•		
390		Brown silty clayey SAND with rock fragments, moist, medium dense, (SC-SM)	End of boring at 20 feet below grade.	5		5-7-9	16	•		
385										
385										
380										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
12.3 ft.
12 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. B-30
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
405										
5										
400										
10										
395										
15										
390										
20										
385										
25										
380										
30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 ____ ft.

CAVE IN DEPTH
12.3 ft.
12 ft.
 ____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

RECORD OF SOIL EXPLORATION

Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

Date Started 08/13/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/13/2019

SAMPLER TYPE	SAMPLE CONDITIONS		SHIM	DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>3.5</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>3.2</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. P-2
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/14/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/14/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Dark reddish brown sandy lean CLAY, dry, stiff, (Probable FILL as CL)	3" topsoil	8		4-5-6	11	•		
410		Dusky red sandy lean CLAY, moist, stiff, (CL-Natural)		15		2-4-5	9	•		
5		- medium stiff		17		1-2-3	5	•		
405		- stiff		18		4-4-5	9	•		
			End of boring at 8 feet below grade.							
10										
400										
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
2 ft.
2 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

RECORD OF SOIL EXPLORATION

SAMPLER									
Datum	<u>MSL</u>	Hammer Wt.	<u>140</u>	lbs.	Hole Diameter	<u>3 1/4 in.</u>	Foreman	<u>Viktor</u>	
Surf. Elev.	<u>410.7</u>	Ft.	Hammer Drop	<u>30</u>	in.	Rock Core Diameter	<u>NA</u>	Inspector	<u>Robel Gibbe</u>
Date Started	<u>08/14/2019</u>	Pipe Size	<u>2 O.D.</u>	in.	Boring Method	<u>HSA-SPT</u>	Date Completed	<u>08/14/2019</u>	

SAMPLER TYPE	SAMPLE CONDITIONS		GROUND WATER	CAVE IN DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>2</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>2</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

RECORD OF SOIL EXPLORATION

SAMPLER									
Datum	<u>MSL</u>	Hammer Wt.	<u>140</u>	lbs.	Hole Diameter	<u>3 1/4 in.</u>	Foreman	<u>Viktor</u>	
Surf. Elev.	<u>403.5</u>	Ft.	Hammer Drop	<u>30</u>	in.	Rock Core Diameter	<u>NA</u>	Inspector	<u>Robel Gibbe</u>
Date Started	<u>08/07/2019</u>	Pipe Size	<u>2 O.D.</u>	in.	Boring Method	<u>HSA-SPT</u>	Date Completed	<u>08/07/2019</u>	

SAMPLER TYPE	SAMPLE CONDITIONS		SOIL WATER	DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>3.6</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>3</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

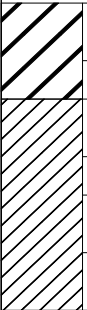
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. P-5
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 408.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Dusky red with light brown Fat CLAY with sand, dry, stiff, (CH-Natural)	4" topsoil	18		1-5-8	13			
405		Dusky red with dark brown lean CLAY with sand, moist, medium stiff, (CL)		18		4-3-3	6			
5		- dark brown, stiff		18		3-3-6	9			
400		- brown and dark brown, very stiff		18		5-9-9	18			
10			End of boring at 8 feet below grade.							
395										
15										
390										
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
7.2 ft.
7 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. P-6
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 407.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot		
							N	C U R V E	
<div><div></div><div>0</div><div></div><div>405</div><div></div><div>5</div><div></div><div>400</div><div></div><div>10</div><div></div><div>395</div><div></div><div>15</div><div></div><div>390</div><div></div><div>20</div><div></div><div>385</div><div></div><div>25</div><div></div><div>380</div><div></div><div>30</div><div></div><div>375</div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div>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SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
6.3 ft.
6 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

RECORD OF SOIL EXPLORATION

Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

Date Started 08/07/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/07/2019

SAMPLER TYPE	SAMPLE CONDITIONS		SHOULDER WATER	SOIL DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>6.3</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>6</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. P-8
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
<div><div></div><div>0</div><div></div><div>405</div><div>5</div><div></div><div>400</div><div>10</div><div></div><div>395</div><div>15</div><div></div><div>390</div><div>20</div><div></div><div>385</div><div>25</div><div></div><div>380</div><div>30</div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><di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SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED AT COMPLETION
 I - INTACT AFTER 24 HRS.
 U - UNDISTURBED AFTER ____ HRS.
 L - LOST

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
3.3 ft.
3 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

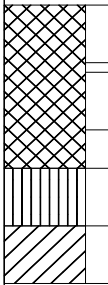
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. P-9
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 406 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
405		Dusky red and light brown lean CLAY with sand, moist, medium stiff, (Probable FILL as CL)	4" Asphalt Concrete	6		3-4-4	8			
		Dark grayish brown with light brown sandy lean CLAY, with trace of organic, moist, medium stiff, (Probable FILL as CL)		16		4-3-4	7			
400		Reddish brown sandy SILT, moist, loose, (ML-Natural)		16		3-4-3	7			
		Reddish brown lean CLAY with sand, moist, stiff, (CL)		17		5-6-7	13			
		End of boring at 8 feet below grade.								
395										
390										
385										
380										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
6 ft.
6 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING


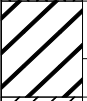
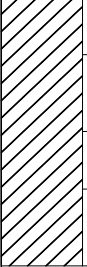
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-1
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 410.3 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot CURVE			
							N	10	30	50
410 0		Red and dark brown sandy lean CLAY with gravel, with trace of organic, dry, stiff, (Probable FILL as CL)	4" topsoil	6		4-6-5	11			
		Dark red with light brown Fat CLAY with sand, moist, stiff, (CH-Natural)		18		5-5-7	12			
405 5		Brown sandy lean CLAY with rock fragments, dry, very stiff, (CL)		11		11-11-11	22			
		Brown with red sandy lean CLAY, moist, stiff, (CL) <CLAY>	Infiltration Rate=0.05 in/hr	15		4-5-6	11			
400 10				24		5-8-10-12	18			
			End of boring at 12 feet below grade.							
395 15										
390 20										
385 25										
380 30										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 ft.

CAVE IN DEPTH
7 ft.
6.5 ft.
 ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-2
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 411.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/05/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/05/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark brown sandy lean CLAY with gravel, with trace of organic, dry, very stiff, (Probable FILL as CL)	4" topsoil	18		6-11-8	19			
410		Red and dark brown silty CLAY with gravel, with trace of organic, moist, (Probable FILL as CL-ML)		6		4-4-5	9			
5		Brown with black sandy lean CLAY, moist, stiff, (CL-Natural)		14		3-4-6	10			
405		- medium stiff		15		2-3-4	7			
10		Reddish brown Fat CLAY with sand, moist, very stiff, (CH)		15		5-7-9-12	16			
400			End of boring at 12 feet below grade.							
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
8.3 ft.
7.4 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

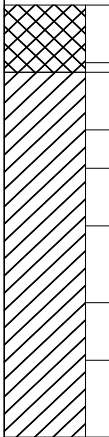
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-3
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/02/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/02/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
410		Red and light brown silty ROCK fragments with sand, moist, medium dense, (Probable FILL as GM)	3" Asphalt Concrete	10		9-10-12	22			
5		Dusky red sandy lean CLAY, moist, very stiff, (CL) - with rock fragments, stiff	5" Aggregate Base	18		5-12-12	24			
405				11		5-7-7	14			
10		Dusky red with light brown sandy lean CLAY with rock fragments, moist, stiff, (CL)		18		6-5-8	13			
400				20		4-6-6-8	12			
15			End of boring at 12 feet below grade.							
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
6 ft.
5.2 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

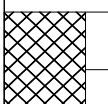

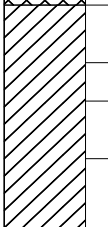


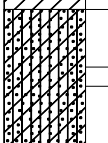


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-4
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 412.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/14/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/14/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown clayey SAND with gravel, with trace of organic, dry, medium dense, (Probable FILL as SC)	3" topsoil	3		5-8-11	19			
410		Dusky red sandy lean CLAY with rock fragments, moist, very stiff, (CL-Natural)		15		7-7-10	17			
5				8		5-8-9	17			
405		Dusky red with light brown silty clayey SAND, with trace of rock fragments, medium dense, (SC-SM) <SANDY CLAY LOAM>	Infiltration Rate=0.45 in/hr	14		6-8-9	17			
10				14		8-7-8	15			
400			End of boring at 12 feet below grade.							
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

**GROUND
WATER**
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

**CAVE IN
DEPTH**
4.2 ft.
3.9 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

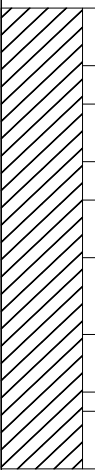
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-5
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 411.3 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/14/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/14/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot				
							N	C U R V E			
								10	30	50	
0		Dusky red sandy lean CLAY, with trace of rock fragments, moist, stiff, (CL-Natural) - with light brown - very stiff	2" Asphalt Concrete 5" Aggregate Base End of boring at 12 feet below grade.	14		2-4-6	10	●			
410								10	●		
								10	●		
5								13	●		
405								14	●		
				15		2-5-9	27	●			
10				12		7-13-14					
400											
15											
395											
20											
390											
25											
385											
30											
380											

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

**GROUND
WATER**
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

**CAVE IN
DEPTH**
6.6 ft.
6 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

RECORD OF SOIL EXPLORATION

Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

Date Started 08/13/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/13/2019

SAMPLER TYPE	SAMPLE CONDITIONS		SHOULDER WATER	SOIL DEPTH	BORING METHOD
DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED	D - DISINTEGRATED	AT COMPLETION	<u>Dry</u> ft.	<u>6</u> ft.	HSA - HOLLOW STEM AUGERS
PT - PRESSED SHELBY TUBE	I - INTACT	AFTER 24 HRS.	<u>Dry</u> ft.	<u>5.9</u> ft.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	U - UNDISTURBED	AFTER ____ HRS.	_____ ft.	_____ ft.	DC - DRIVING CASING
RC - ROCK CORE	L - LOST				MD - MUD DRILLING

STANDARD PENETRATION TEST-DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS.

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-7
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 405 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/13/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/13/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
		Reddish brown, light brown and brown lean CLAY with sand, moist, stiff, (Probable FILL as CL) - reddish brown, dark bluish gray and brown	6" Asphalt Concrete 2" Aggregate Base	14		3-3-6	9			
		Dusky red sandy lean CLAY, moist, stiff, (CL-Natural)		6		3-6-7	13			
400	5			17		3-8-7	15			
		- with dark bluish gray, with rock fragments, very stiff		6		7-10-10	20			
395	10	- dusky red and light brown, stiff		15		7-5-8	13			
			End of boring at 12 feet below grade.							
390	15									
385	20									
380	25									
375	30									

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
5.4 ft.
5 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING


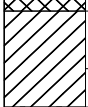
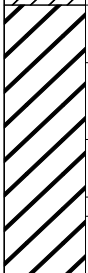
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-8
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Jim Russell
 Surf. Elev. 412.5 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/13/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/13/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown clayey SAND with rock fragments, dry, medium dense, (Probable FILL as SC)	3" topsoil	3		6-12-16	28			
410		Reddish brown lean CLAY with sand, moist, stiff, (CL-Natural)		15		3-4-5	9			
5		Dusky red sandy Fat CLAY, moist, stiff, (CH)		16		2-4-5	9			
405		<CLAY>	Infiltration Rate=0.25 in/hr	16		3-3-6	9			
10				17		3-4-6	10			
400			End of boring at 12 feet below grade.							
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
3.9 ft.
3.9 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-9
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 403.7 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

AT COMPLETION
 AFTER 24 HRS.
 AFTER ____ HRS.

GROUND WATER
Dry ft.
Dry ft.
 _____ ft.

CAVE IN DEPTH
3.9 ft.
3.9 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

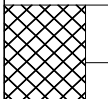
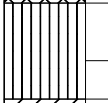
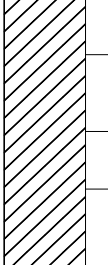
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-10
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 406.8 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/08/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/08/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Dark brown sandy lean CLAY with rock fragments, with trace of organic, dry, very stiff, (Probable FILL as CL)	3" topsoil	12		6-9-12	21			
405		Reddish brown SILT with sand, moist, medium dense, (ML-Natural)		18		4-5-6	11			
5		Dusky red sandy lean CLAY, moist, stiff, (CL)		18		5-5-7	12			
400		- with rock fragments <CLAY> - very stiff	Infiltration Rate = 0.2 in/hr	15		5-6-7	13			
10				24		8-8-13-19	21			
395			End of boring at 12 feet below grade.							
15										
390										
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
6.6 ft.
6.5 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

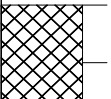

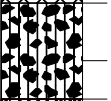

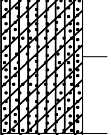

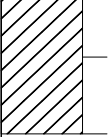


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Area Elementary School Boring No. SWM-11
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4 in. Foreman Viktor
 Surf. Elev. 407.6 Ft. Hammer Drop 30 in. Rock Core Diameter NA Inspector Robel Gibbe
 Date Started 08/06/2019 Pipe Size 2 O.D. in. Boring Method HSA-SPT Date Completed 08/06/2019

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown and light brown lean CLAY with sand, with trace of organic, dry, stiff, (Probable FILL as CL)	3" topsoil	11		4-5-6	11			
405		Brown silty GRAVEL, moist, medium dense, (Probable FILL as GM)		1		5-11-19	30			
5		Dark reddish brown silty clayey SAND with rock fragments, moist, medium dense, (SC-SM Natural)		14		5-6-7	13			
400			Infiltration Rate=0.53 in/hr							
10		Brown with dusky red sandy lean CLAY, moist, stiff, (CL) <CLAY>		18		5-5-6	11			
				24		6-9-11-12	20			
395			End of boring at 12 feet below grade.							
15										
390										
20										
385										
25										
380										
30										
375										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
7.3 ft.
6.3 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

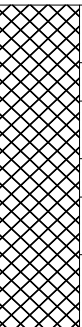
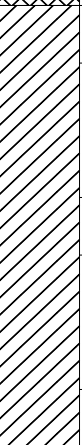
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-1
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 412 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot CURVE			
							N	10	30	50
0		Red with trace of yellowish brown sandy silty CLAY, with trace of gravel and organic, moist, medium stiff, (Possible FILL as CL-ML) - stiff	3" topsoil	18		2-2-3	5	●		
410				17		3-9-4	13	●		
5		- red and dark brown		3		4-4-5	9	●		
405		Reddish brown with trace of yellowish brown sandy LEAN CLAY, moist, stiff, (CL-Natural)		16		2-4-5	9	●		
10										
400		- with rock fragments		18		8-6-9	15	●		
15										
395		- very stiff		5		7-9-10	19	●		
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
15.8 ft.
14.1 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

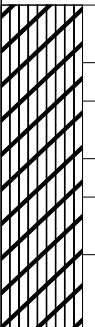
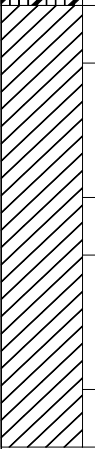

HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-2
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 413.5 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot				
							N	C U R V E			
								10	30	50	
0		Reddish brown sandy silty CLAY, with trace of rock fragments, moist, medium stiff, (CL-ML Natural) - stiff	4" topsoil	18		2-3-5	8	●			
410				18	3-4-5	9	●				
5				18	3-3-6	9	●				
405		Red sandy LEAN CLAY, moist, very stiff, (CL)	End of boring at 20 feet below grade.	18		5-7-9	16	●			
10											
400		- stiff		18	4-6-8	14	●				
15		- with rock fragments, very stiff									
395				18	5-8-8	16	●				
20											
390											
25											
385											
380											

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE
 NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

**GROUND
WATER**
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

**CAVE IN
DEPTH**
16.9 ft.
14 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-3
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 411.3 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0			4" topsoil	17		3-3-4	7			
410		Dark brown sandy silty CLAY, with trace of organic, moist, medium stiff, (Possible FILL as CL-ML)		18		6-9-7	16			
		Brown sandy LEAN CLAY with rock fragments, moist, very stiff, (CL-Natural)		18		5-6-8	14			
5		- stiff		18		4-8-7	15			
405				18		4-7-10	17			
		- very stiff		18		7-7-11	18			
10										
400										
15										
395										
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

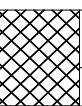
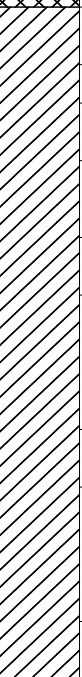
SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	AT COMPLETION AFTER 24 HRS. AFTER ____ HRS.	GROUND WATER <u>Dry</u> ft. <u>Dry</u> ft. _____ ft.	CAVE IN DEPTH <u>15.9</u> ft. <u>7.4</u> ft. _____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
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HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-4
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Reddish brown and yellowish brown silty clayey SAND with rock fragments, moist, very loose, (Possible FILL as SC-SM)	4" topsoil	18		2-1-1	2	●		
405		Reddish brown sandy LEAN CLAY with rock fragments, moist, stiff, (CL-Natural)		18		5-6-7	13	●		
5				18		5-6-7	13	●		
400				18		6-7-4	11	●		
10										
395				18		4-5-9	14	●		
15										
390				18		4-5-6	11	●		
20			End of boring at 20 feet below grade.							
25										
385										
380										
30										


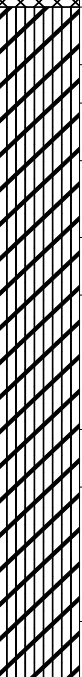
SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	AT COMPLETION AFTER 24 HRS. AFTER ____ HRS.	GROUND WATER <u>Dry</u> ft. ____ ft. ____ ft.	CAVE IN DEPTH <u>15.9</u> ft. ____ ft. ____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
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HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-5
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Brown sandy silty CLAY with rock fragments, moist, medium stiff, (Possible FILL as CL-ML)	4" topsoil	18		3-3-5	8	•		
410		Reddish brown with yellowish brown sandy silty CLAY, moist, stiff, (CL-ML Natural)		18		3-4-5	9	•		
5		- red		18		3-5-6	11	•		
405				18		3-4-6	10	•		
10				18		4-4-6	10	•		
400			End of boring at 20 feet below grade.	18		3-4-7	11	•		
15										
395										
20										
390										
25										
385										
30										
380										

SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	GROUND WATER AT COMPLETION <u>Dry</u> ft. AFTER 24 HRS. <u>Dry</u> ft. AFTER ____ HRS. _____ ft.	CAVE IN DEPTH <u>16.1</u> ft. <u>15.8</u> ft. _____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
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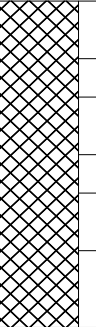



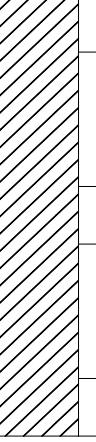



HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-6
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown sandy lean CLAY with rock fragments, trace of organic, moist, stiff, (Possible FILL as CL)	4" topsoil	18		3-6-6	12			
410				18	3-6-7	13				
5				16	4-6-8	14				
405		Reddish brown sandy LEAN CLAY, with trace of rock fragments, moist, stiff, (CL-Natural)		17		3-5-6	11			
10										
400				18	6-7-8	15				
15										
395		- red		18		6-5-7	12			
20										
390										
25										
385			End of boring at 20 feet below grade.							
30										
380										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
16.6 ft.
16.3 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-7
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER
Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 411.5 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0										
410		Dark brown sandy lean CLAY, moist, medium stiff, (Possible FILL as CL)	4" Asphalt Concrete 4" Aggregate Base	8		3-4-2	6			
		Brown with black sandy LEAN CLAY, moist, soft, (CL-Natural)		12		2-2-2	4			
5		- stiff, with rock fragments		18		3-6-7	13			
405										
				18		3-6-7	13			
10										
400		- brown		18		3-5-7	12			
15										
395										
				18		6-6-6	12			
20			End of boring at 20 feet below grade.							
390										
25										
385										
30										
380										

SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	AT COMPLETION AFTER 24 HRS. AFTER ____ HRS.	GROUND WATER <u>Dry</u> ft. ____ ft. ____ ft.	CAVE IN DEPTH <u>17.4</u> ft. ____ ft. ____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
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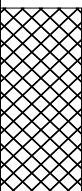
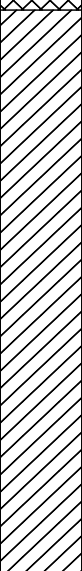
HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-8
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 409 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot				
							N	C U R V E			
								10	30	50	
0		Brown lean CLAY with sand, moist, stiff, (Possible FILL as CL)	4" topsoil	18		2-3-9	12	●			
405		Vari-colored sandy silty CLAY with gravel, trace of organic, moist, medium stiff, (Possible FILL as CL-ML)		18		3-3-4	7	●			
5		Brown sandy LEAN CLAY with rock fragments, moist, stiff, (CL-Natural)		15		3-6-9	15	●			
400		Brown LEAN CLAY with sand, moist, stiff, (CL)		18		5-4-5	9	●			
10											
395		Reddish brown sandy LEAN CLAY, with trace of rock fragments, stiff, (CL)	End of boring at 20 feet below grade.	18		3-5-9	14	●			
15											
390		- very stiff		5		11-12-9	21	●			
20											
385											
25											
380											
30											

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. _____ ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
15.5 ft.
 _____ ft.
 _____ ft.


BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-9
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 407 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Reddish brown sandy LEAN CLAY, with trace of rock fragments, moist, stiff, (CL-Natural)	4" topsoil	18		3-6-6	12	●		
405				13		5-5-8	13	●		
5		- very stiff		18		5-7-9	16	●		
400		- stiff		18		4-4-6	10	●		
10										
395		- with trace of black		18		4-6-8	14	●		
15										
390				18		5-6-9	15	●		
20			End of boring at 20 feet below grade.							
385										
25										
380										
30										
375										

SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	AT COMPLETION AFTER 24 HRS. AFTER ____ HRS.	GROUND WATER <u>Dry</u> ft. ____ ft. ____ ft.	CAVE IN DEPTH <u>17.4</u> ft. ____ ft. ____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
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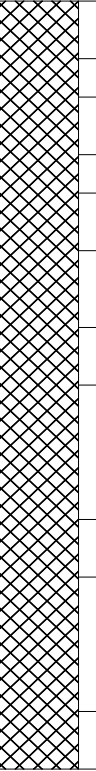







HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-10
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 413 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-04-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-04-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot				
							N	C U R V E			
								10	30	50	
0		Dark reddish brown sandy silty CLAY with gravel, moist, stiff, (Possible FILL as CL-ML)	4" topsoil	18		2-3-5	8				
410		Reddish brown sandy LEAN CLAY, moist, stiff, (Possible FILL as CL)		13		4-5-6	11				
5		- red		18		3-5-5	10				
405		Red and yellowish brown silty clayey SAND, moist, medium dense, (Possible FILL as SC-SM)		18		3-8-10	18				
10											
400		Reddish brown with yellowish brown sandy LEAN CLAY, moist, stiff, (Possible FILL as CL)	End of boring at 20 feet below grade.	18		4-5-8	13				
15											
395		Reddish brown with dark brown sandy LEAN CLAY, with trace of organic, moist, very stiff, (Possible FILL as CL)		18		6-8-10	18				
20											
390											
25											
385											
30											
380											

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. Dry ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
16.3 ft.
15.5 ft.
 _____ ft.

BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

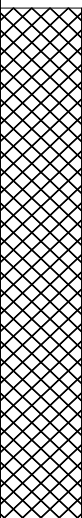




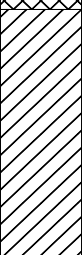


HILLIS - CARNES ENGINEERING ASSOCIATES, INC.

RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-11
 Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
 Surf. Elev. 393 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
 Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot			
							N	C U R V E		
								10	30	50
0		Brown with dark brown sandy silty CLAY with gravel, moist, medium stiff, (Possible FILL as CL-ML)	4" topsoil	18		3-3-5	8			
390		Red sandy LEAN CLAY, with trace of rock fragments, moist, stiff, (Possible FILL as CL)		18		3-3-6	9			
5		Red with yellowish brown silty clayey SAND, with rock fragments, moist, medium dense, (Possible FILL as SC-SM)		15		6-9-15	24			
385		Dark reddish brown sandy lean CLAY, with trace of organic, moist, stiff, (Possible FILL as CL)		3		5-4-5	9			
380		Reddish brown sandy LEAN CLAY, moist, stiff, (CL-Natural)	End of boring at 20 feet below grade.	18		4-4-5	9			
375										
20					18		3-5-7	12		
370										
25										
365										
30										
360										

SAMPLER TYPE
 DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED
 PT - PRESSED SHELBY TUBE
 CA - CONTINUOUS FLIGHT AUGER
 RC - ROCK CORE

SAMPLE CONDITIONS
 D - DISINTEGRATED
 I - INTACT
 U - UNDISTURBED
 L - LOST

GROUND WATER
 AT COMPLETION Dry ft.
 AFTER 24 HRS. _____ ft.
 AFTER ____ HRS. _____ ft.

CAVE IN DEPTH
17 ft.
 _____ ft.
 _____ ft.

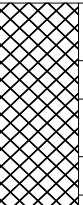
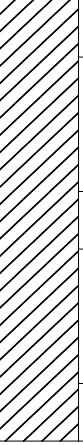
BORING METHOD
 HSA - HOLLOW STEM AUGERS
 CFA - CONTINUOUS FLIGHT AUGERS
 DC - DRIVING CASING
 MD - MUD DRILLING

HILLIS - CARNES
ENGINEERING ASSOCIATES, INC.
RECORD OF SOIL EXPLORATION

Project Name Waverley Elementary School - Preliminary Borings Boring No. PB-12
Location 191 and 201 Waverley Drive, Frederick, MD Job # 19418A

SAMPLER

Datum MSL Hammer Wt. 140 lbs. Hole Diameter 3 1/4" Foreman Viktor Velasquez
Surf. Elev. 394.5 Ft. Hammer Drop 30 in. Rock Core Diameter _____ Inspector Robel Gibbe
Date Started 04-05-19 Pipe Size 2 in. Boring Method HSA Date Completed 04-05-19

ELEVATION/ DEPTH	SOIL SYMBOLS/ SAMPLE CONDITIONS	Description	Boring and Sampling Notes	Rec.	NM	SPT	SPT Blows/Foot C U R V E			
							N	10	30	50
0		Very dark brown sandy SILT, with trace of organic, moist, medium stiff, (Possible FILL as ML)	4" topsoil	3		4-4-4	8	●		
390		Dark brown sandy silty CLAY, with gravel, moist, stiff, (Possible FILL as CL-ML)		17		3-4-5	9	●		
5				13		7-5-6	11	●		
385		Red sandy LEAN CLAY, moist, stiff, (CL-Natural)		17		4-5-8	13	●		
10										
380		- reddish brown		18		5-5-9	14	●		
15			End of boring at 20 feet below grade.							
375				18		5-4-5	9	●		
20										
370										
25										
365										
30										

SAMPLER TYPE DRIVEN SPLIT SPOON UNLESS OTHERWISE NOTED PT - PRESSED SHELBY TUBE CA - CONTINUOUS FLIGHT AUGER RC - ROCK CORE	SAMPLE CONDITIONS D - DISINTEGRATED I - INTACT U - UNDISTURBED L - LOST	AT COMPLETION AFTER 24 HRS. AFTER ____ HRS.	GROUND WATER <u>Dry</u> ft. ____ ft. ____ ft.	CAVE IN DEPTH <u>17.3</u> ft. ____ ft. ____ ft.	BORING METHOD HSA - HOLLOW STEM AUGERS CFA - CONTINUOUS FLIGHT AUGERS DC - DRIVING CASING MD - MUD DRILLING
--	--	---	---	---	--

KEY TO SYMBOLS

Symbol	Description
--------	-------------

Strata symbols



Fill



Low plasticity
clay



Silty low plasticity
clay

Notes:

1. Exploratory borings were drilled on 04-05-19 using a 6-inch outside diameter hollow stem auger.
2. Water level readings were taken during drilling and upon completion of each boring. Borings were backfilled upon completion.
3. Boring locations were selected by project HCEA and staked in the field by HCEA using existing site features as refernce.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

KEY TO SYMBOLS

Symbol Description

Strata symbols



Fill



Silt



Low plasticity
clay



High plasticity
clay



Poorly graded clayey
silty sand



Clayey gravel



Silty gravel



Elastic silt



Silty sand

Notes:

1. Exploratory borings were drilled on 08/06/2019 using a 6-inch outside diameter hollow stem auger.
2. Water level readings were taken during drilling and upon completion of each boring. Borings were backfilled upon completion.
3. Boring locations were selected by project HCEA and staked in the field by HCEA using existing site features as reference.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

GENERAL NOTES FOR SUBSURFACE RECORDS

1. Numbers in the sampling data column (5, 9, 12) indicate blows required to drive a 2-inch OD, 1-3/8-inch ID sampling spoon 6 inch, using a 140-pound hammer, falling 30 inches, according to ASTM-D-1586.
2. Visual classification of soil is in accordance with terminology set forth in the "Soil Identification" sheet (attached). The unified soil classification symbols shown are based on visual inspection, in accordance with ASTM-D2487.
3. Water level readings that were obtained in the borings during and after completion are noted on the subsurface records.
4. Refusal at the surface of rock, boulder, or obstruction is defined as a penetration resistance of 50 blows for 1-inch penetration or less.
5. The subsurface records and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions including the material properties of soil (and rock) and water levels at other locations may differ from conditions as reported on subsurface records with the passage of time.
6. The depth and thickness of the surface strata indicated on the section profile (if any) were generalized from and interpolated between the test borings. The transition between materials is most likely more gradual than indicated. These stratification lines were used for our analytical purposes and should be used as a basis of design or construction cost estimates.
7. Rock coring is in accordance with ASTM-2113: NQ size rock core, 2-inch OD.
8. Undisturbed samples were obtained in accordance with ASTM 01587-94: 2- or 3-inch thin walled shelly tubes.
9. Transitions between soil strata are represented on the subsurface records. A solid line represents an observed transition, and a dashed line represents an estimated change.
10. Keys to symbols and abbreviations:
RQD = rock quality designation
REC = recovery %
WOH = weight of hammer advanced sample spoon 6 inches
WOR = weight of drilling rods advanced sample spoon 6 inches
%M = natural moisture content

Cohesive Soils (Clay, Silt, and Combinations)		Non-Cohesive Soils (Silt, Sand, Gravel, and Combinations)	
Consistency		Density	
Very Soft	2 blows/ft or less	Very Loose	4 blows/ft or less
Soft	3 to 4 blows/ft	Loose	5 to 10 blows/ft
Medium Stiff	5 to 8 blows/ft	Medium Dense	11 to 30 blows/ft
Stiff	9 to 15 blows/ft	Dense	31 to 50 blows/ft
Very Stiff	16 to 30 blows/ft	Very Dense	51 blows/ft or more
Hard	31 blows/ft or more		

SOIL IDENTIFICATION

A. DEFINITION OF SOIL GROUP NAMES (ASTM D-2487-83)

Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean gravels Less than 5% fines	GW	Well graded gravel	
			GP	Poorly graded gravel	
		Gravels with fines More than 12% fines	GM	Silty gravel	
			GC	Clayey gravel	
	Sands – 50% or more of coarse fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	Well-graded sand	
			SP	Poorly graded sand	
		Sands with fines More than 12% fines	SM	Silty sand	
			SC	Clayey sand	
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit Less than 50 Low to medium plasticity	Inorganic	CL	Lean clay	
			ML	Silt	
		Organic	OL	Organic clay Organic silt	
			Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH
	MH	Elastic silt			
	Organic	OH		Organic Clay Organic silt	
		Highly Organic Soils		Primarily organic matter, dark in color, and organic odor	

B. DEFINITION OF MINOR COMPONENT PROPORTIONS

Minor Component	Approximate Percentage of Fraction by Weight
Adjective Form Gravelly, Sandy Silty, Clayey	30% or more of gravel or sand 12% or more of silt or clay
With Silt, Sand, Gravel and Clay	15% or more of sand or gravel 5% to 12% of silt or clay
Trace Sand, Gravel Silt, Clay	Less than 15% of sand or gravel Less than 5% of silt or clay

C. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS – Unified Soil Classification Symbols are shown above as group symbols. Dual symbols are used for borderline classifications.

BOULDERS & COBBLES – Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3- to 12-inch size.

ROCK FRAGMENTS – Angular pieces of rock within residual soils resulting from differential weathering of the underlying bedrock.

QUARTZ – A hard silica mineral often found in residual soils.

IRONITE – Iron oxide deposited within a soil layer forming cemented deposits.

CEMENTED SAND – Localized rock-like deposits within a soil stratum composed of sand grains cemented by iron oxide or other materials.

MICA – A soft plate of silica mineral found in many rocks and in residual or transported soils derived therefrom.

TOPSOIL – Surface soils that support plant life and which contain more than 5% organic matter.

FILL – Manmade deposit containing soil, rock, and often foreign matter.

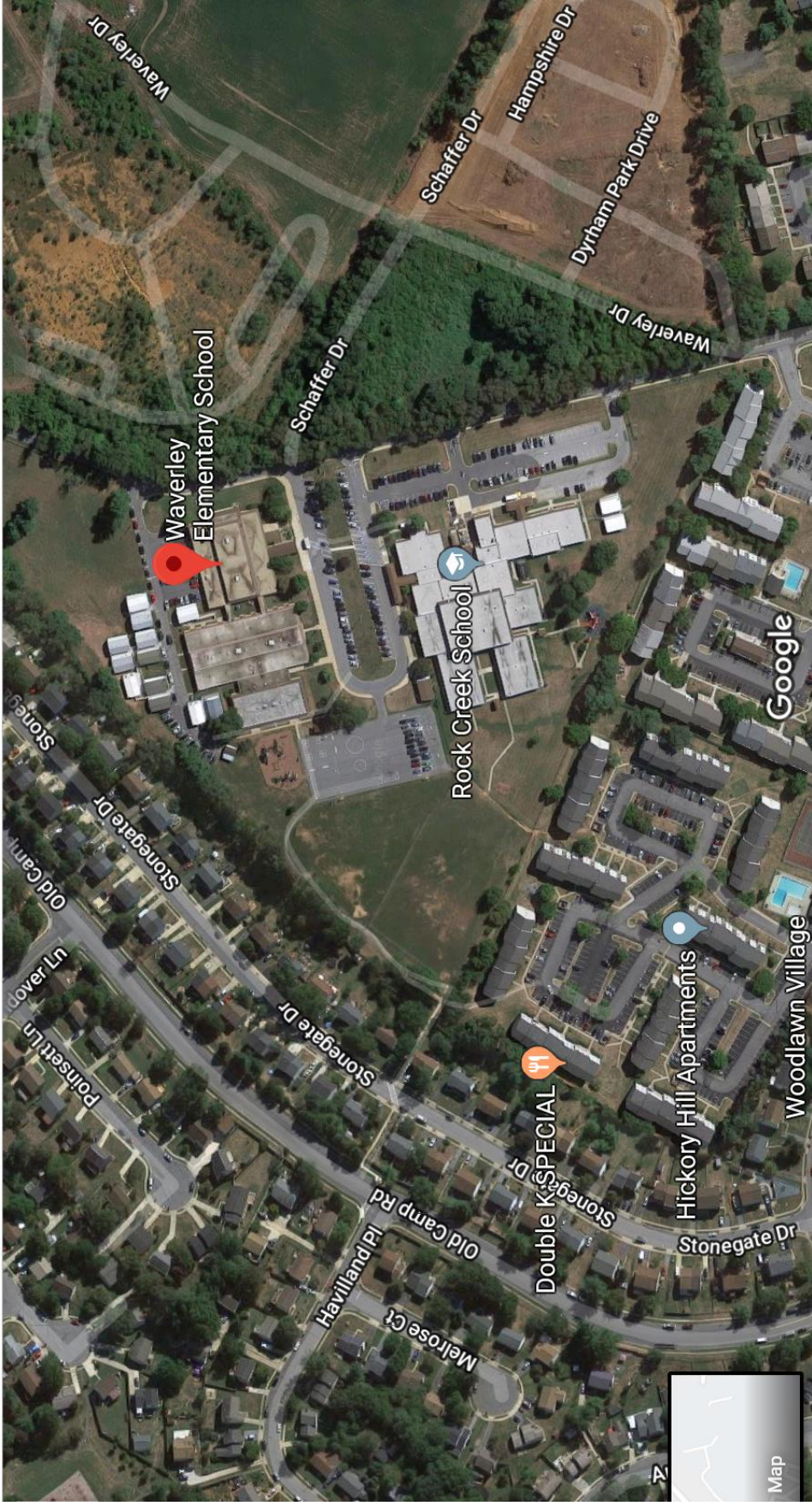
PROBABLE FILL – Soils which contain no visually detected foreign matter but which are suspect with regard to origin.

LENSES – 0 to ½-inch seam of minor soil component.

LAYERS – ½- to 12-inch seam of minor soil component.

POCKET – Discontinuous body of minor soil component.

MOISTURE CONDITIONS – Wet, very moist, moist, or dry to indicate visual appearance of specimen.



HILLIS-CARNES
Engineering Associates, Inc.

PROJECT NO.: 19418A

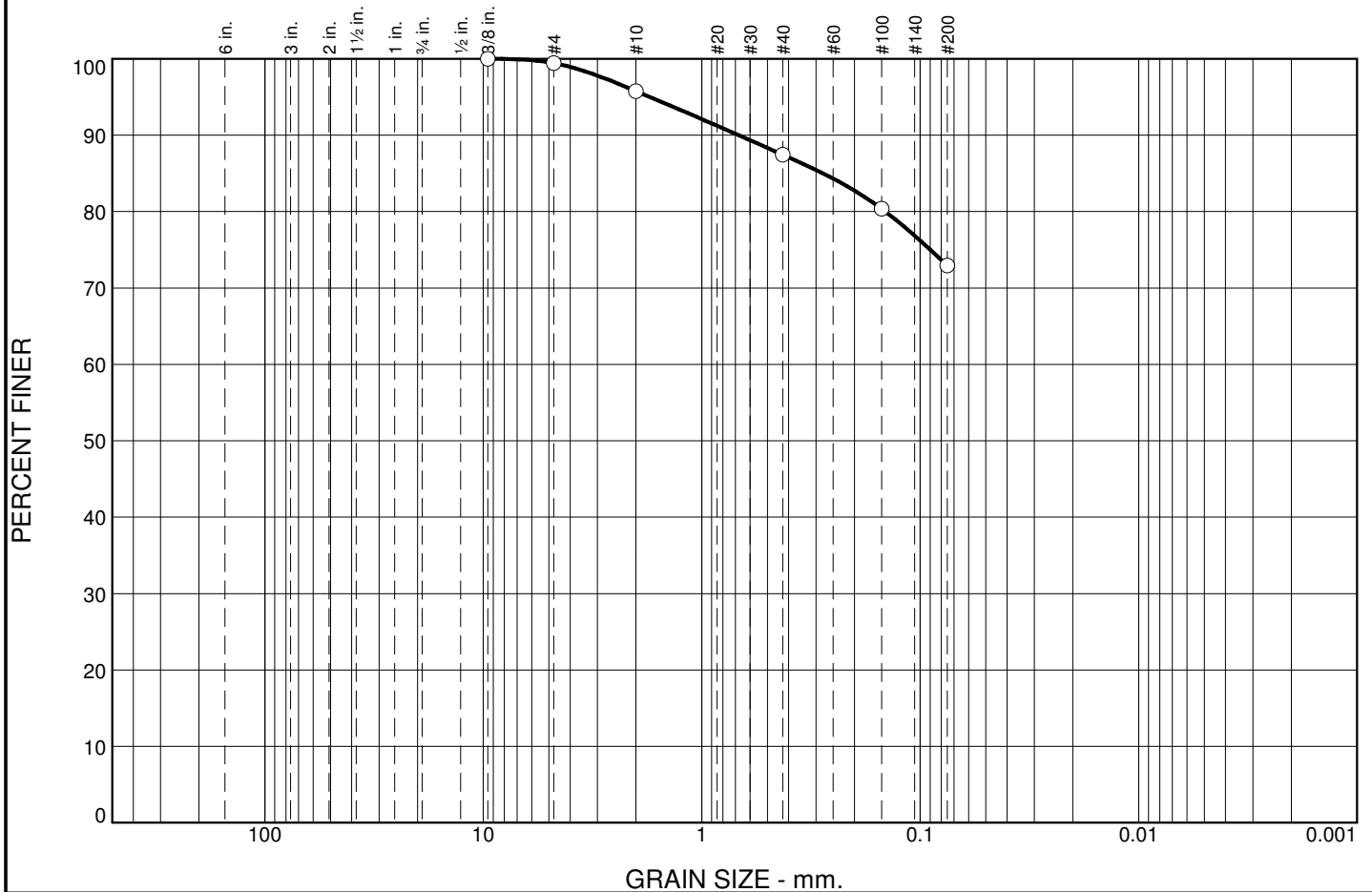
SCALE: NTS

DATE: September 23, 2019

Project Location Plan, Waverley Elementary School – Frederick, MD

DRAWING NO.
5

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.6	26.5	72.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.4		
#10	95.8		
#40	87.4		
#100	80.4		
#200	72.9		

* (no specification provided)

Material Description

Brown SILT with sand, trace rock fragments

Atterberg Limits

PL= 37 LL= 49 PI= 12

Coefficients

D₉₀= 0.6777 D₈₅= 0.2790 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-5(10)

Remarks

Moisture Content: 22.6%

Location: B-1

Sample Number: S-3

Depth: 5.0'-6.5'

Date: 09-20-19

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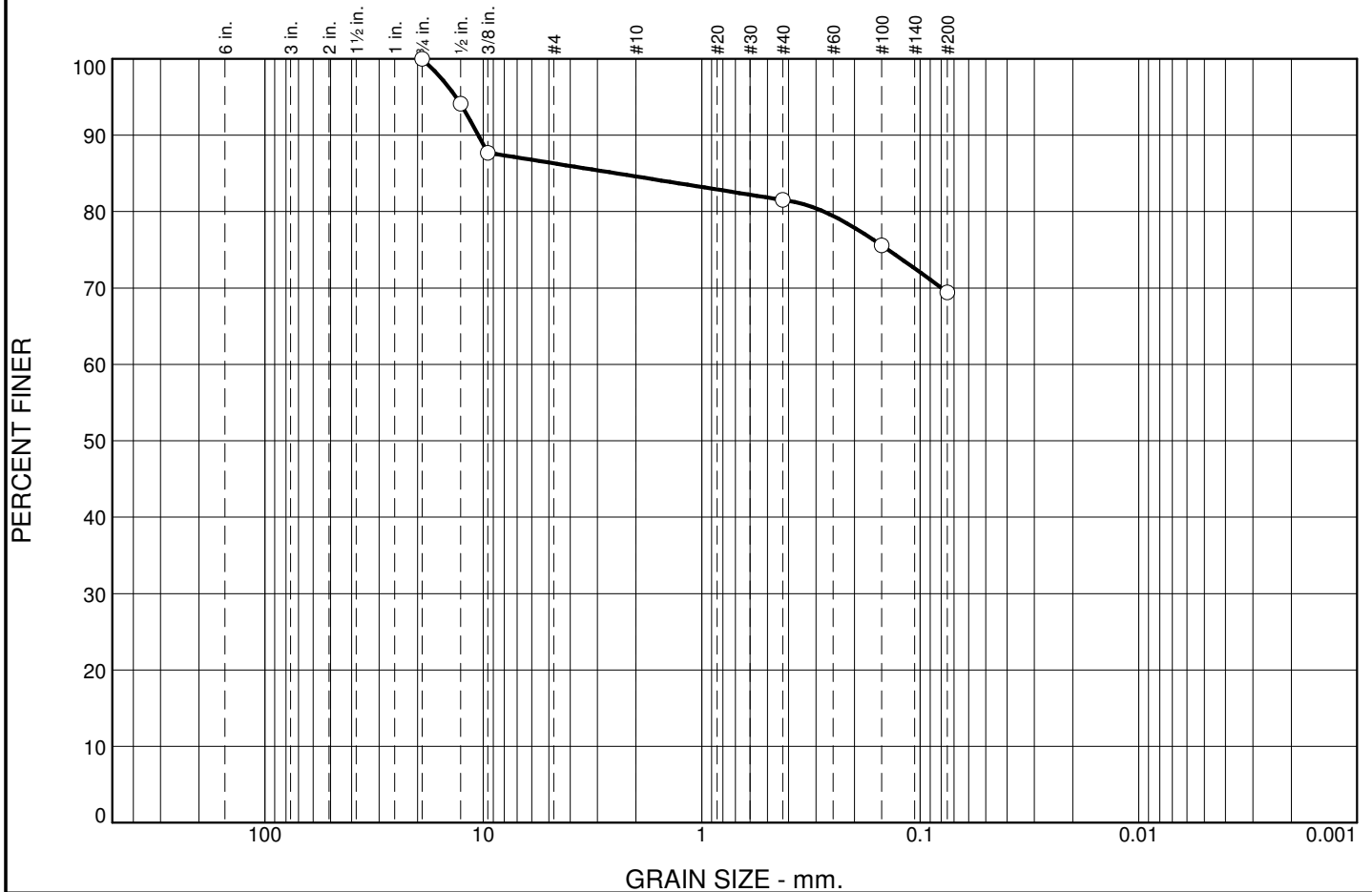
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9693

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	13.7	16.9	69.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	94.1		
0.375	87.7		
#40	81.5		
#100	75.6		
#200	69.4		

* (no specification provided)

Material Description

Reddish brown sandy Fat CLAY, trace rock fragments

Atterberg Limits

PL= 33 LL= 70 PI= 37

Coefficients

D₉₀= 10.5474 D₈₅= 2.4508 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(26)

Remarks

Moisture Content: 22.8%

Location: B-6

Sample Number: S-3

Depth: 5.0'-6.5'

Date: 09-20-19

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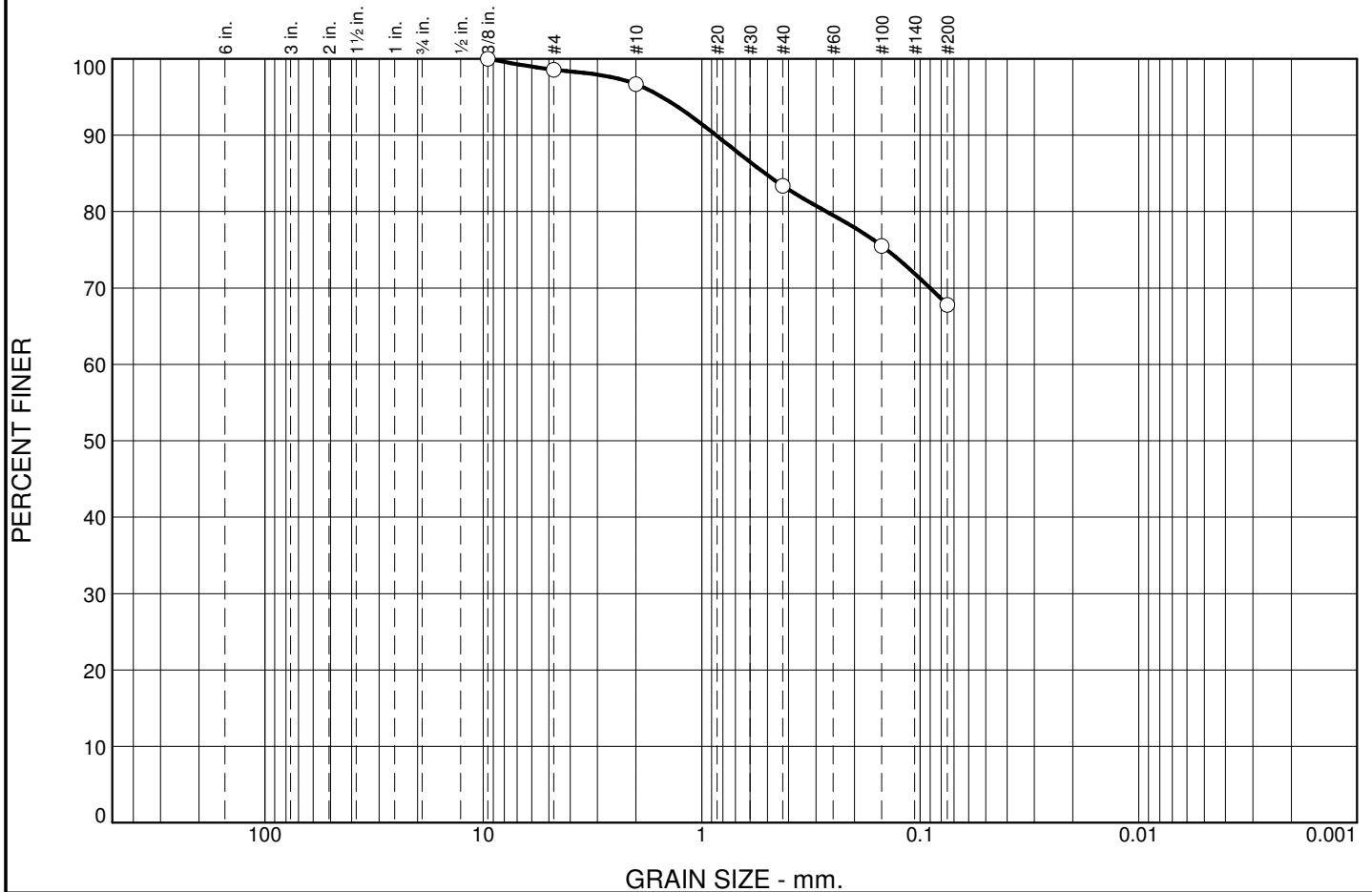
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9694

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	1.4	30.8	67.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	98.6		
#10	96.7		
#40	83.4		
#100	75.5		
#200	67.8		

* (no specification provided)

Material Description

Reddish brown sandy Lean CLAY, trace rock fragments

Atterberg Limits

PL= 24 LL= 45 PI= 21

Coefficients

D₉₀= 0.8601 D₈₅= 0.5131 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(13)

Remarks

Moisture Content: 14.9%

Location: B-7

Sample Number: S-1

Depth: 1.0'-2.5'

Date: 09-20-19

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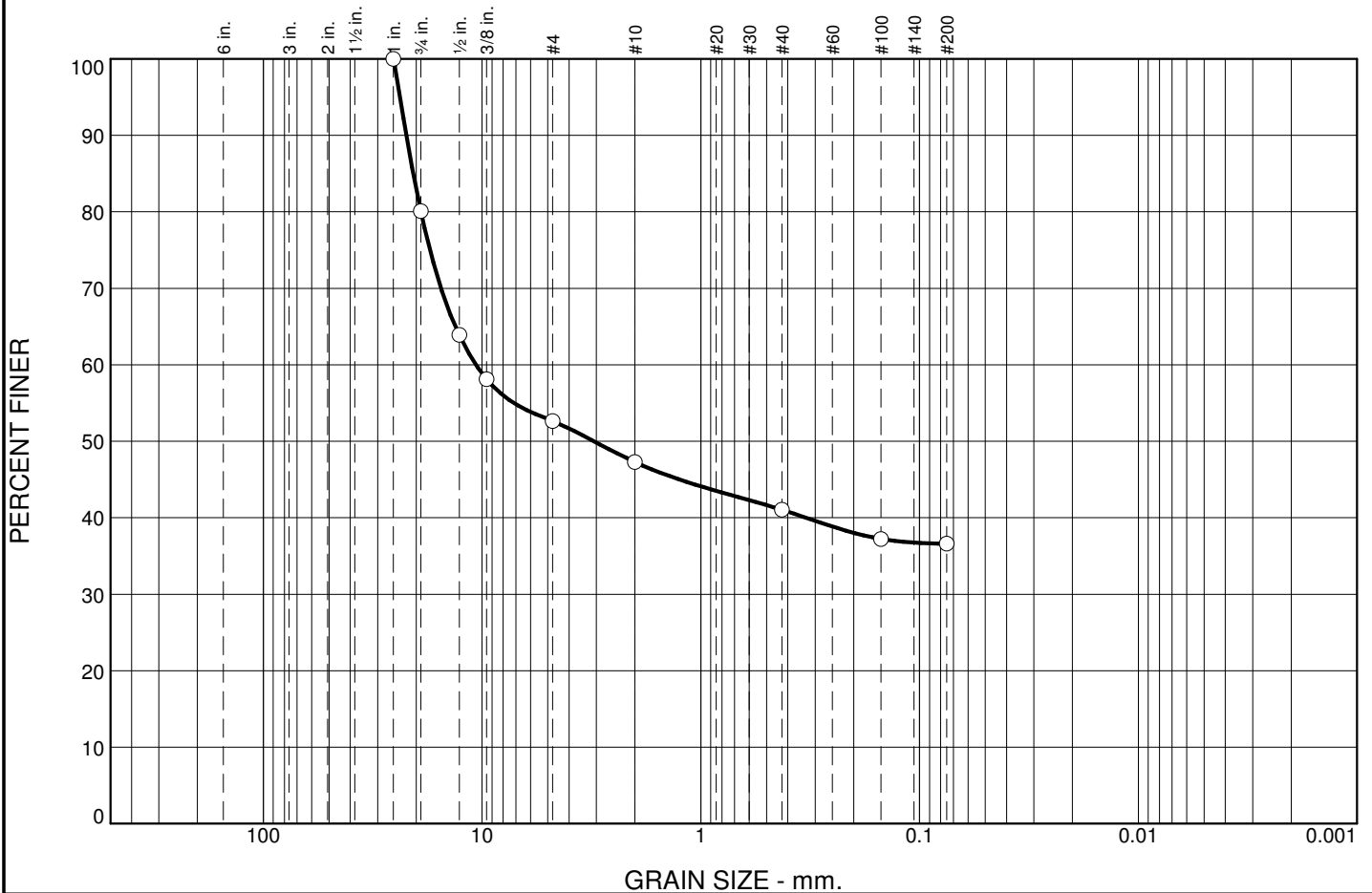
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9695

Particle Size Distribution Report



% +3"

0.0

% Gravel

47.4

% Sand

16.0

% Silt

36.6

% Clay

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
0.75	80.1		
0.5	63.9		
0.375	58.1		
#4	52.6		
#10	47.3		
#40	41.0		
#100	37.2		
#200	36.6		

* (no specification provided)

Material Description

Brown Clayey ROCK fragments with sand

Atterberg Limits

PL= 26

LL= 49

PI= 23

Coefficients

D₉₀= 22.1642

D₈₅= 20.6072

D₆₀= 10.6603

D₅₀= 3.0753

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= GC

AASHTO= A-7-6(3)

Remarks

Moisture Content: 12.5%

Location: B-9

Sample Number: S-3

Depth: 5.0'-6.5'

Date: 09-20-19

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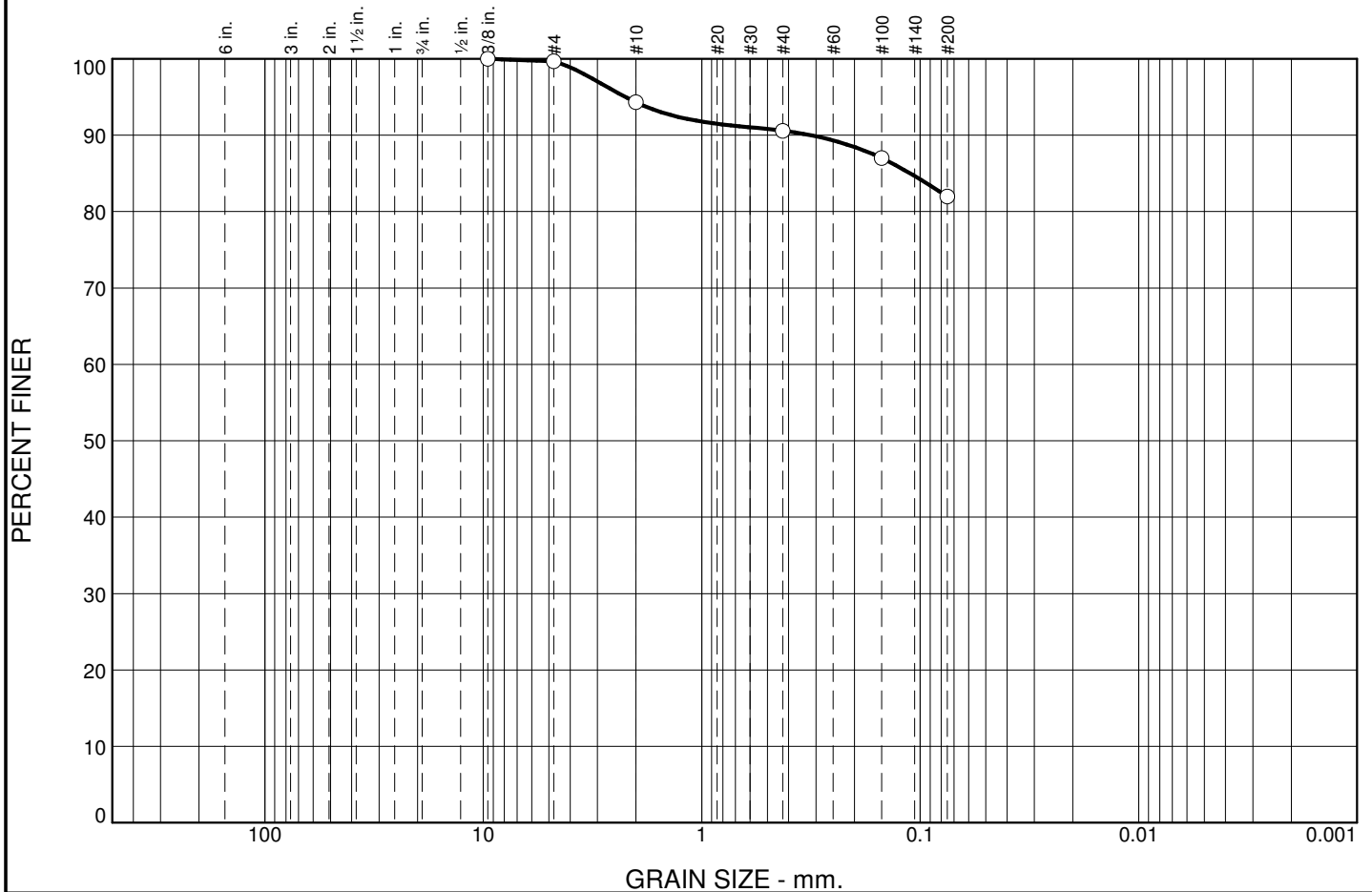
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9696

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.3	17.7	82.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.7		
#10	94.3		
#40	90.6		
#100	87.0		
#200	82.0		

* (no specification provided)

Material Description

Brown Fat CLAY with sand, trace rock fragments

Atterberg Limits

PL= 27 LL= 51 PI= 24

Coefficients

D₉₀= 0.3183 D₈₅= 0.1111 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(21)

Remarks

Moisture Content: 20.8%

Location: B-11

Sample Number: S-3

Depth: 5.0'-6.5'

Date: 09-20-19

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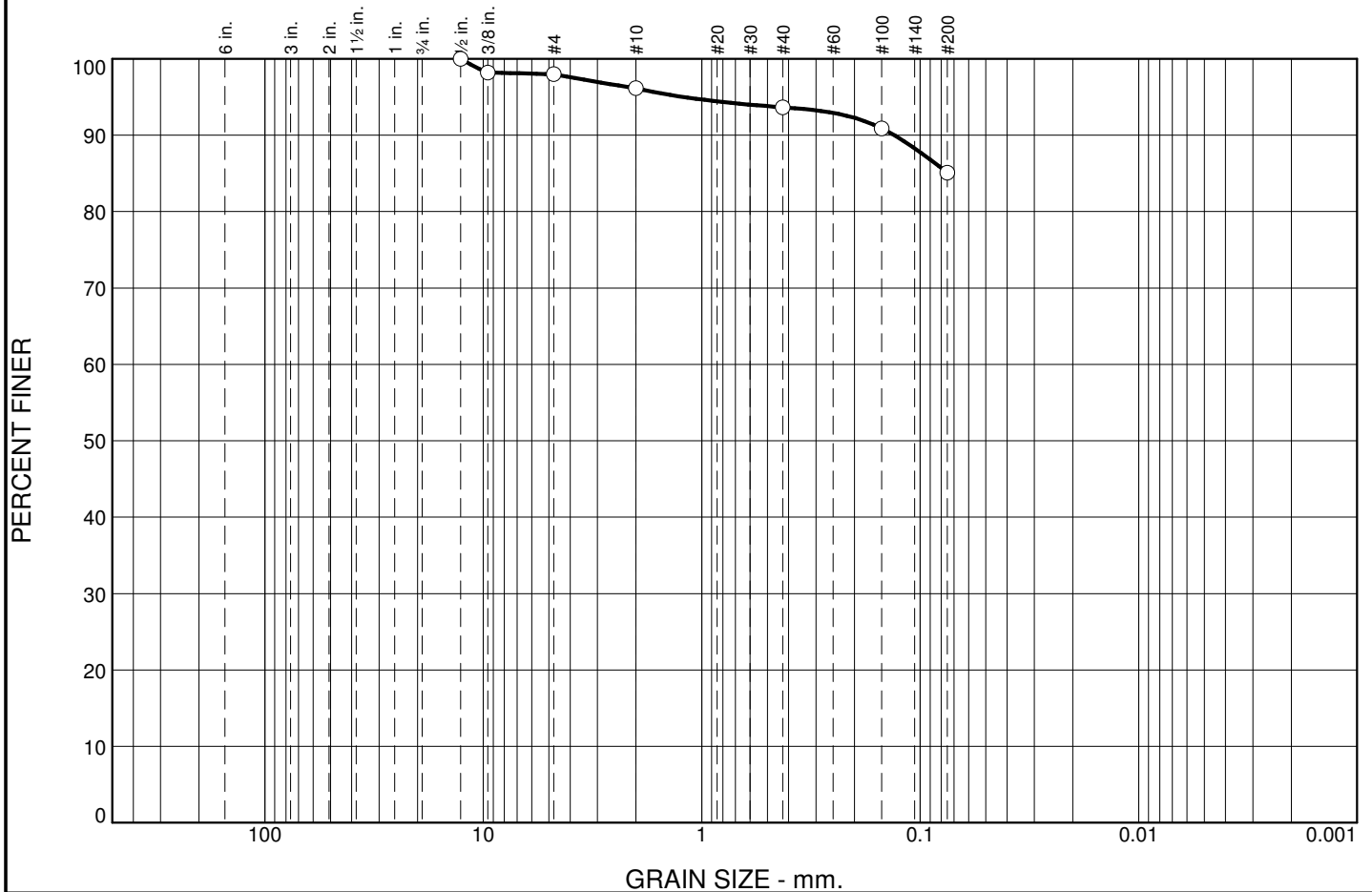
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9697

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	2.0	12.9	85.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	98.2		
#4	98.0		
#10	96.1		
#40	93.6		
#100	90.9		
#200	85.1		

* (no specification provided)

Material Description

Brown Fat CLAY with sand, trace rock fragments

Atterberg Limits

PL= 26 LL= 51 PI= 25

Coefficients

D₉₀= 0.1312 D₈₅= D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(23)

Remarks

Moisture Content: 24.9%

Location: B-15

Sample Number: S-1

Depth: 1.0'-2.5'

Date: 09-20-19

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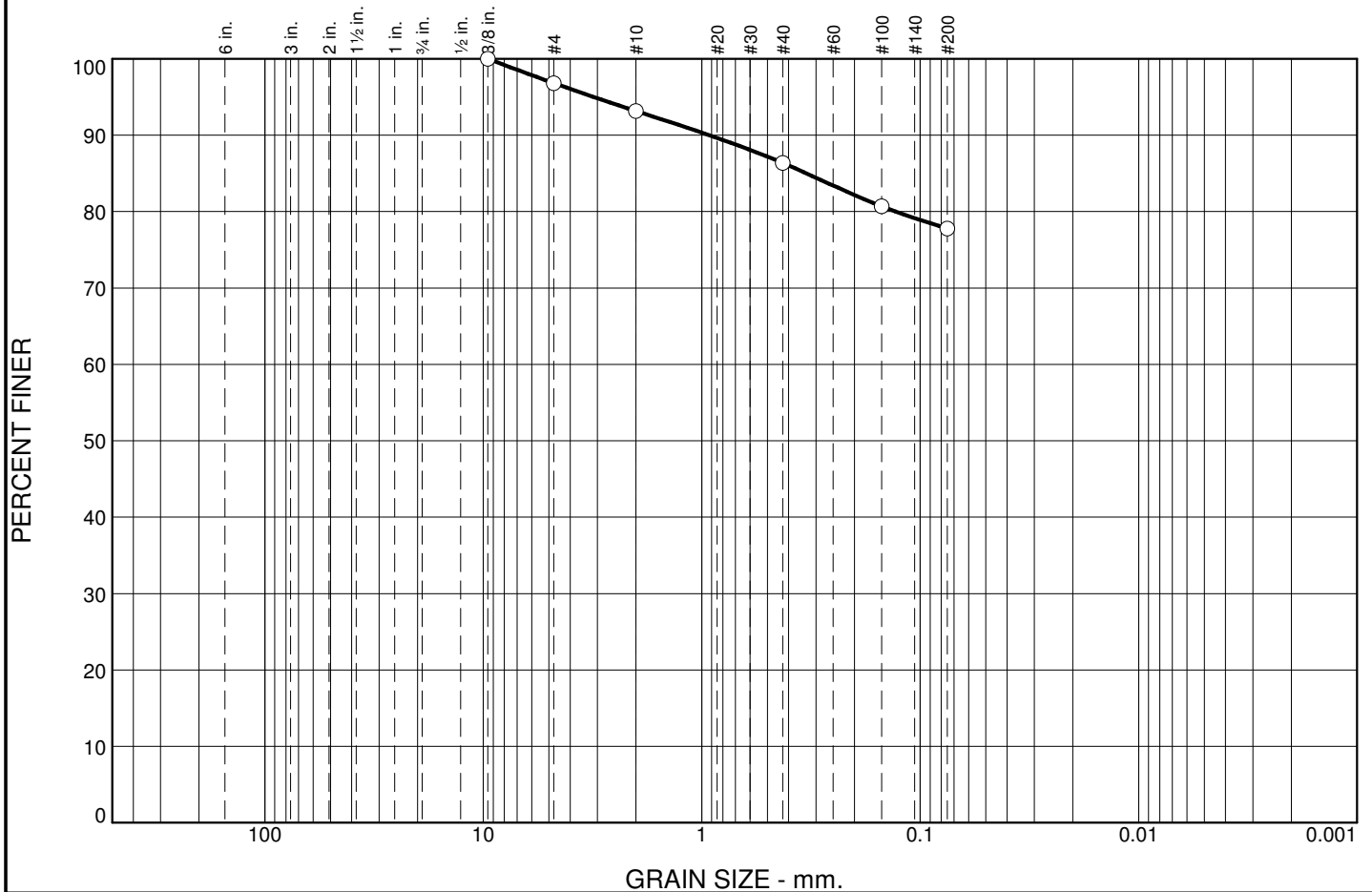
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9698

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	3.2	19.0	77.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	96.8		
#10	93.2		
#40	86.4		
#100	80.7		
#200	77.8		

* (no specification provided)

Material Description

Brown Fat CLAY with sand, trace rock fragments

Atterberg Limits

PL= 33 LL= 73 PI= 40

Coefficients

D₉₀= 0.9224 D₈₅= 0.3314 D₆₀=
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(35)

Remarks

Moisture Content: 30.8%

Location: B-16

Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

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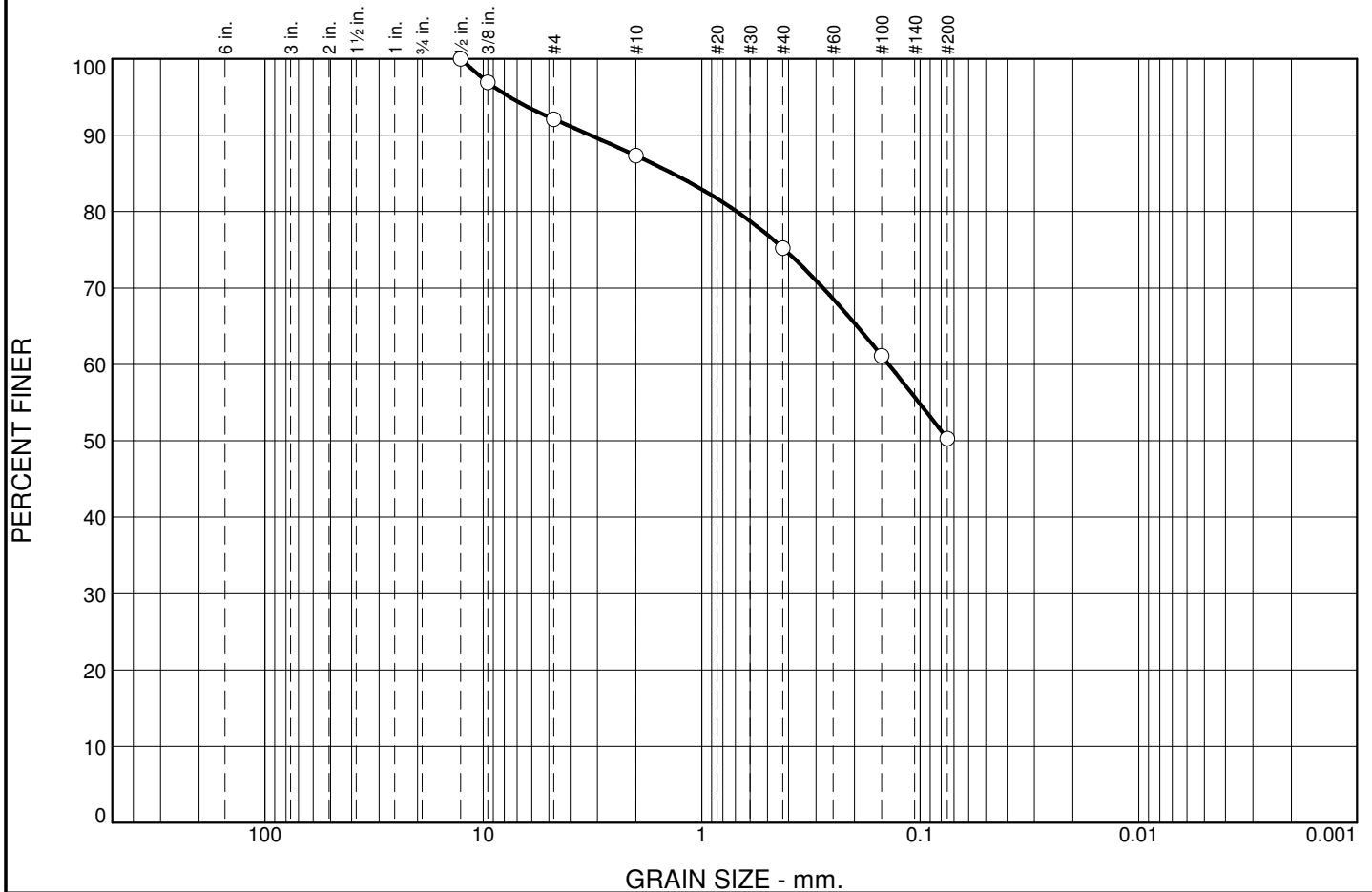
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9699

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	7.9	41.8	50.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	96.9		
#4	92.1		
#10	87.3		
#40	75.2		
#100	61.1		
#200	50.3		

* (no specification provided)

Material Description

Reddish brown Sandy SILT, trace rock fragments

Atterberg Limits

PL= 27 LL= 42 PI= 15

Coefficients

D₉₀= 3.2351 D₈₅= 1.3619 D₆₀= 0.1395
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(5)

Remarks

Moisture Content: 18.7%

Location: B-22

Sample Number: S-2

Depth: 2.5'-4.0'

Date: 09-20-19

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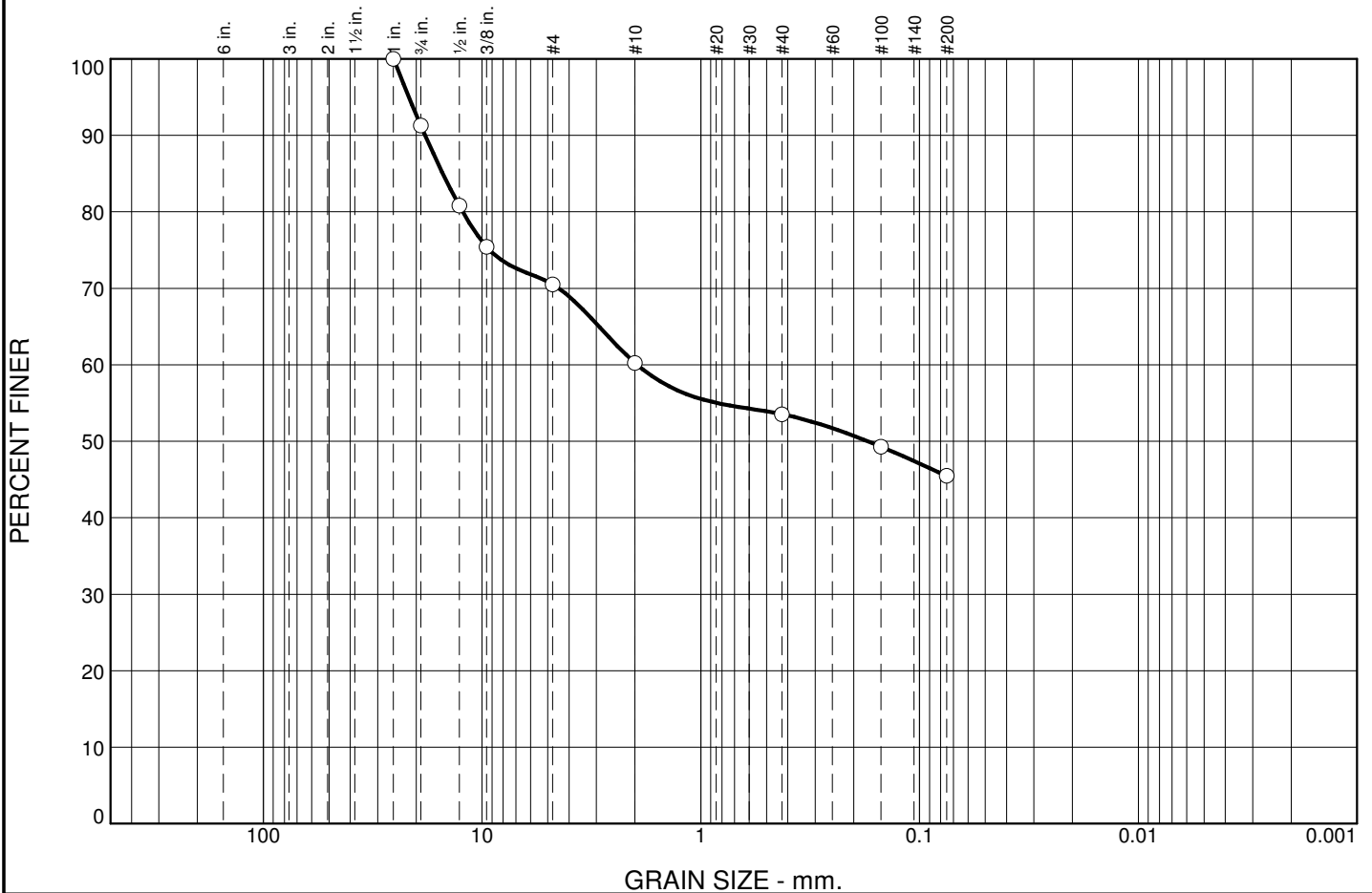
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9700

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	29.5	25.0	45.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
0.75	91.3		
0.5	80.8		
0.375	75.4		
#4	70.5		
#10	60.2		
#40	53.5		
#100	49.3		
#200	45.5		

* (no specification provided)

Material Description

Reddish brown Silty ROCK fragments with sand

Atterberg Limits

PL= 28 LL= 47 PI= 19

Coefficients

D₉₀= 18.2126 D₈₅= 15.1196 D₆₀= 1.9539
D₅₀= 0.1726 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-7-6(5)

Remarks

Moisture Content: 15.2%

Location: B-24

Sample Number: S-3

Depth: 5.0'-6.5'

Date: 09-20-19

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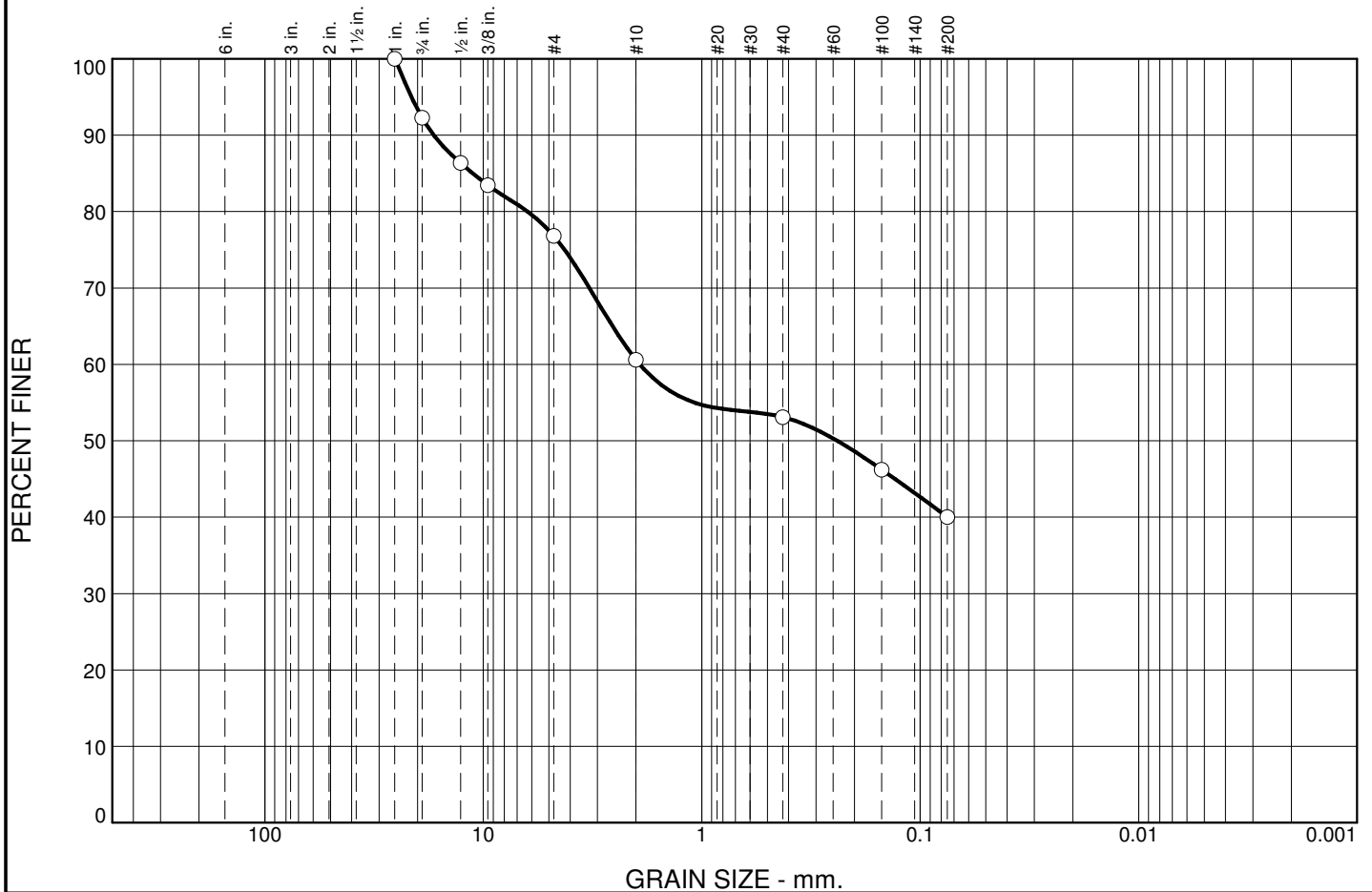
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9701

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	23.2	36.8	40.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
0.75	92.3		
0.5	86.4		
0.375	83.4		
#4	76.8		
#10	60.6		
#40	53.1		
#100	46.2		
#200	40.0		

* (no specification provided)

Material Description

Reddish brown Clayey SAND with rock fragments

Atterberg Limits

PL= 25

LL= 49

PI= 26

Coefficients

D₉₀= 16.8837

D₈₅= 11.1615

D₆₀= 1.9204

D₅₀= 0.2397

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= SC

AASHTO= A-7-6(5)

Remarks

Moisture Content: 13.8%

Location: B-26

Sample Number: S-1

Depth: 1.0'-2.5'

Date: 09-20-19

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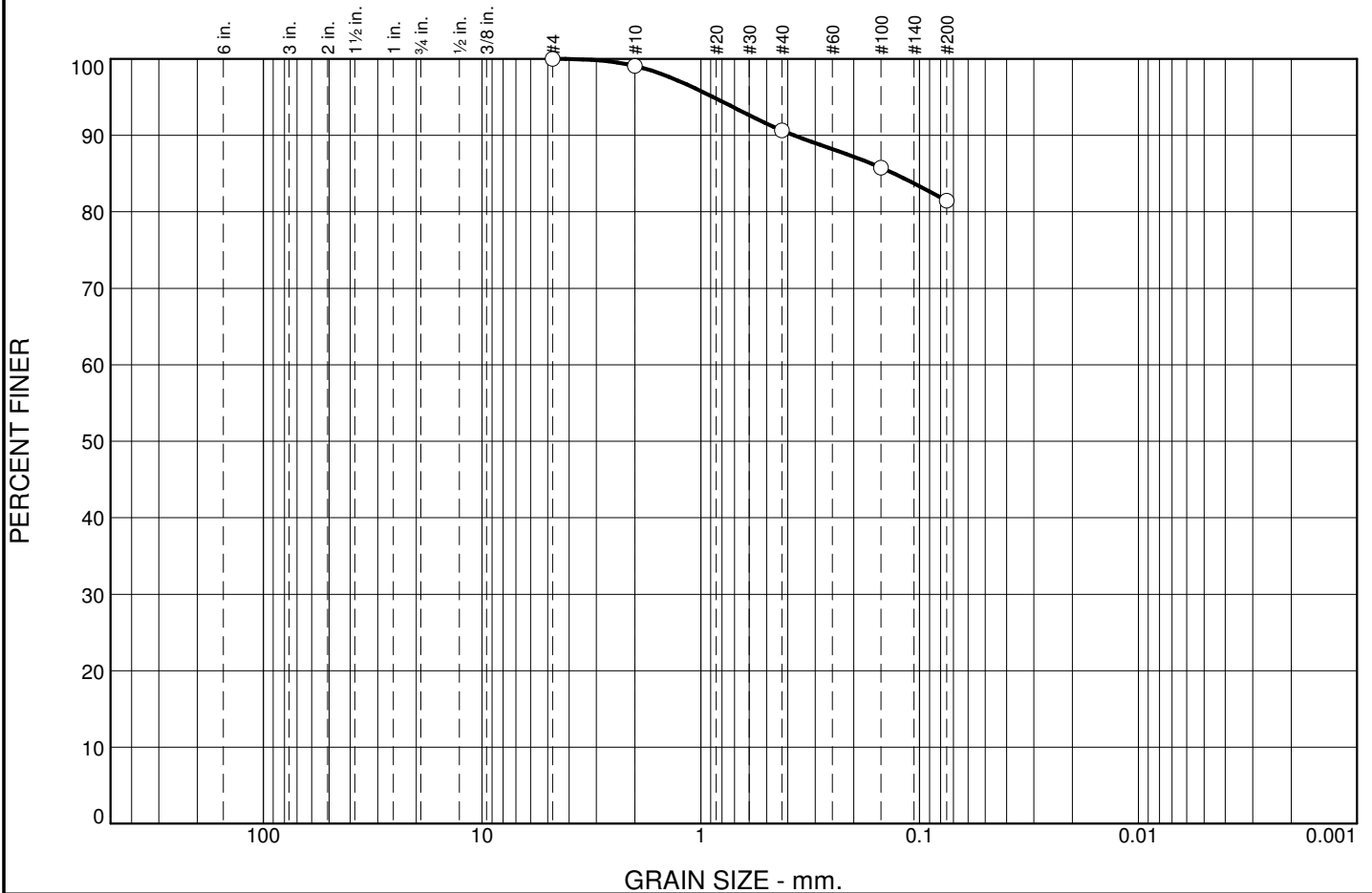
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9702

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	18.6	81.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#40	90.6		
#100	85.8		
#200	81.4		

* (no specification provided)

Material Description

Brown Elastic SILT with sand

Atterberg Limits

PL= 37

LL= 65

PI= 28

Coefficients

D₉₀= 0.3746

D₈₅= 0.1304

D₆₀=

D₅₀=

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= MH

AASHTO= A-7-5(27)

Remarks

Moisture Content: 26.3%

Location: B-28

Sample Number: S-2

Depth: 2.5'-4.0'

Date: 09-20-19

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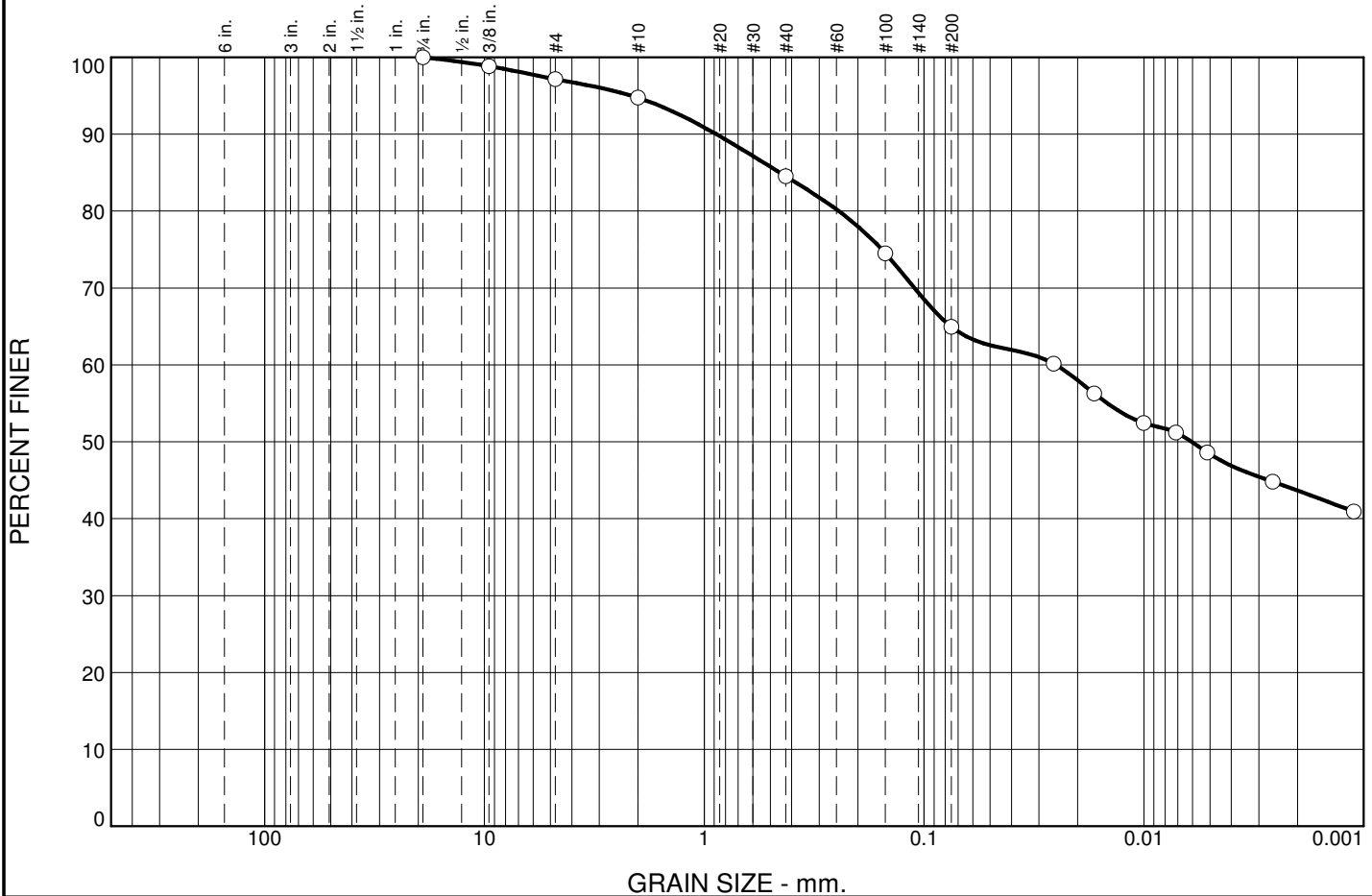
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9703

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	2.9	32.2	16.5	48.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	98.8		
#4	97.1		
#10	94.7		
#40	84.5		
#100	74.5		
#200	64.9		

* (no specification provided)

Material Description

USDA Classification: Clay
USDA Fraction: SAND: 33.7% SILT: 20.2% CLAY: 46.1%

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 0.8811 D₈₅= 0.4531 D₆₀= 0.0251
D₅₀= 0.0061 D₃₀= C_u= D₁₅=
D₁₀= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content: 25.0%

Location: SWM-1

Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

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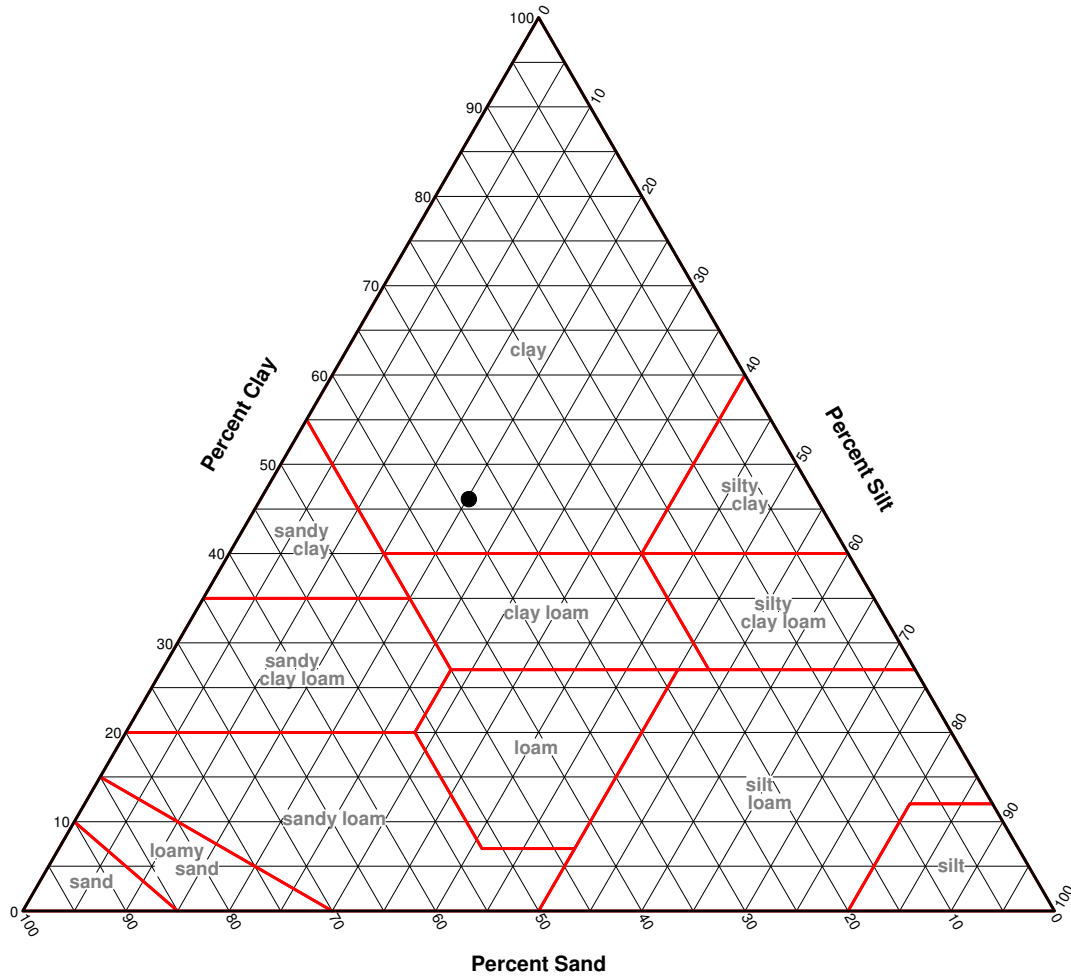
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9704

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9704	S-4	8.5'-10.0'	33.7	20.2	46.1	Clay

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

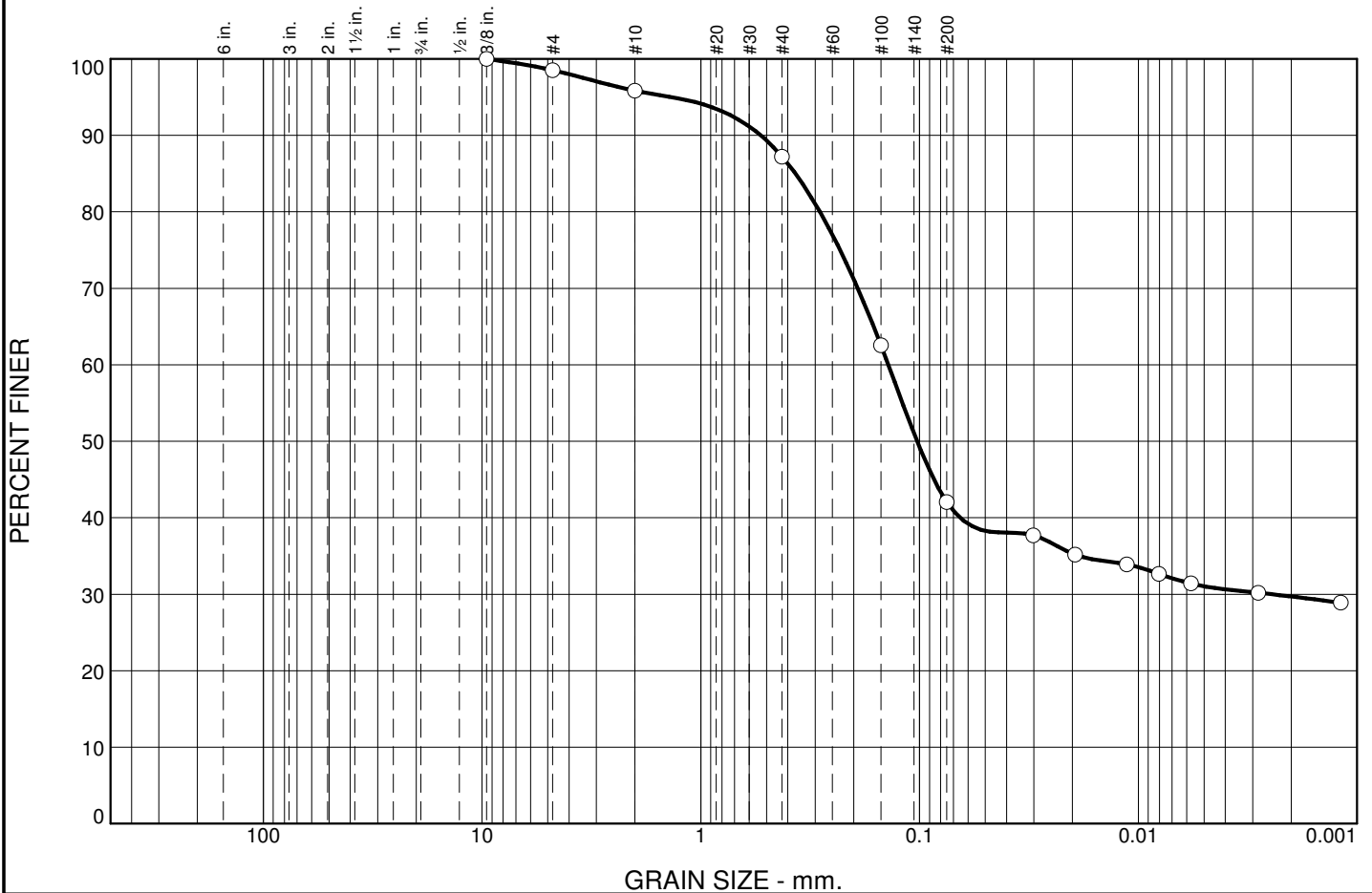
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9704

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	1.5	56.5	11.0	31.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	98.5		
#10	95.8		
#40	87.2		
#100	62.5		
#200	42.0		

* (no specification provided)

Material Description

USDA Classification: Sandy Clay Loam

USDA Fraction: SAND: 59.8% SILT: 9.2% CLAY: 31.0%

Atterberg Limits

PL=

LL=

PI=

Coefficients

D₉₀= 0.5322

D₈₅= 0.3693

D₆₀= 0.1389

D₅₀= 0.1025

D₃₀= 0.0025

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS=

AASHTO=

Remarks

Moisture Content: 12.6%

Location: Swm-4

Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

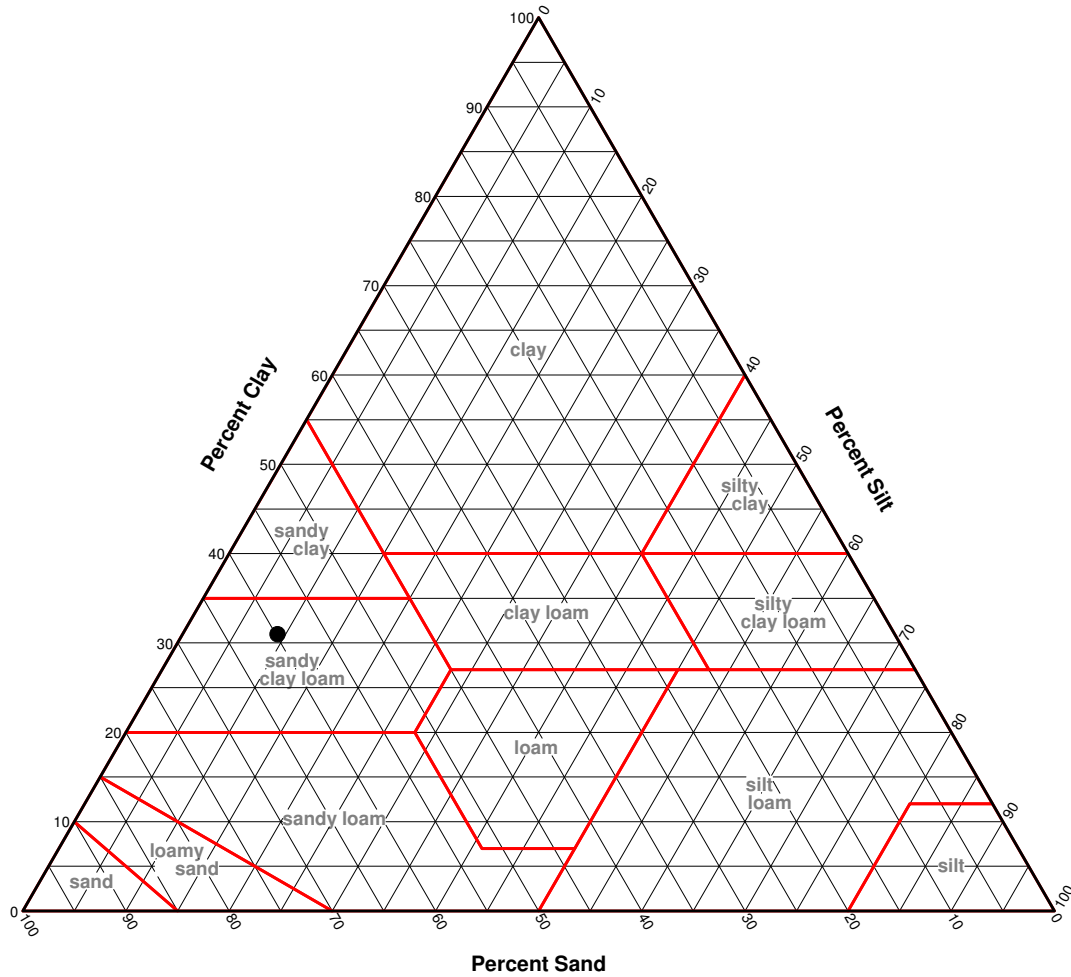
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9705

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9705	S-4	8.5'-10.0'	59.8	9.2	31.0	Sandy clay loam

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

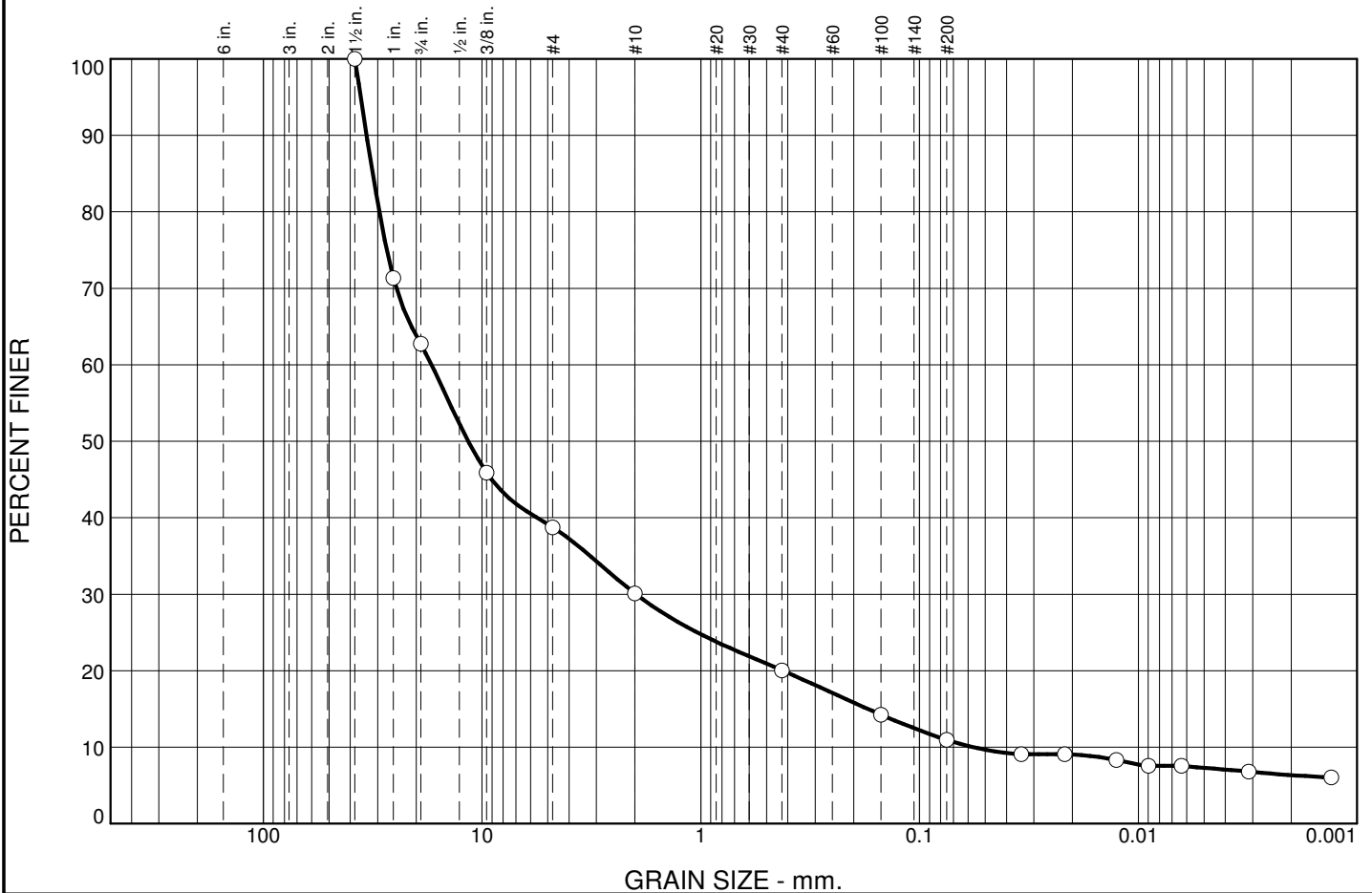
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9705

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	61.2	27.8	3.7	7.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	71.3		
0.75	62.7		
0.375	45.9		
#4	38.8		
#10	30.1		
#40	20.1		
#100	14.3		
#200	11.0		

* (no specification provided)

Material Description

USDA Classification: Sandy Clay Loam

USDA Fraction: SAND: 67.4% SILT: 11.3% CLAY: 21.3%

Atterberg Limits

PL=

LL=

PI=

Coefficients

D₉₀= 33.7175

D₈₅= 31.6118

D₆₀= 17.0353

D₅₀= 11.5510

D₃₀= 1.9769

D₁₅= 0.1719

D₁₀= 0.0567

C_u= 300.29

C_c= 4.04

Classification

USCS=

AASHTO=

Remarks

Moisture Content: 3.7%

Location: SWM-6

Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

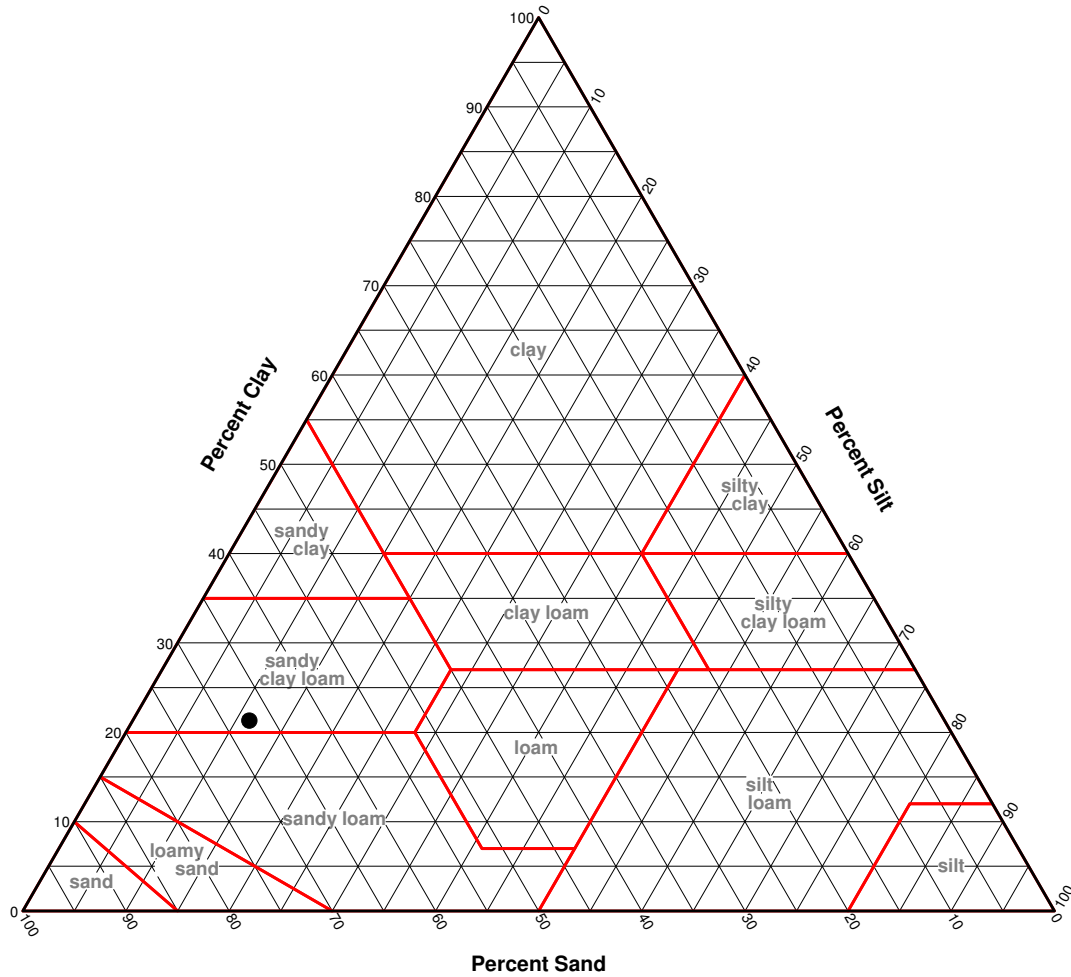
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9706

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9706	S-4	8.5'-10.0'	67.4	11.3	21.3	Sandy clay loam

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

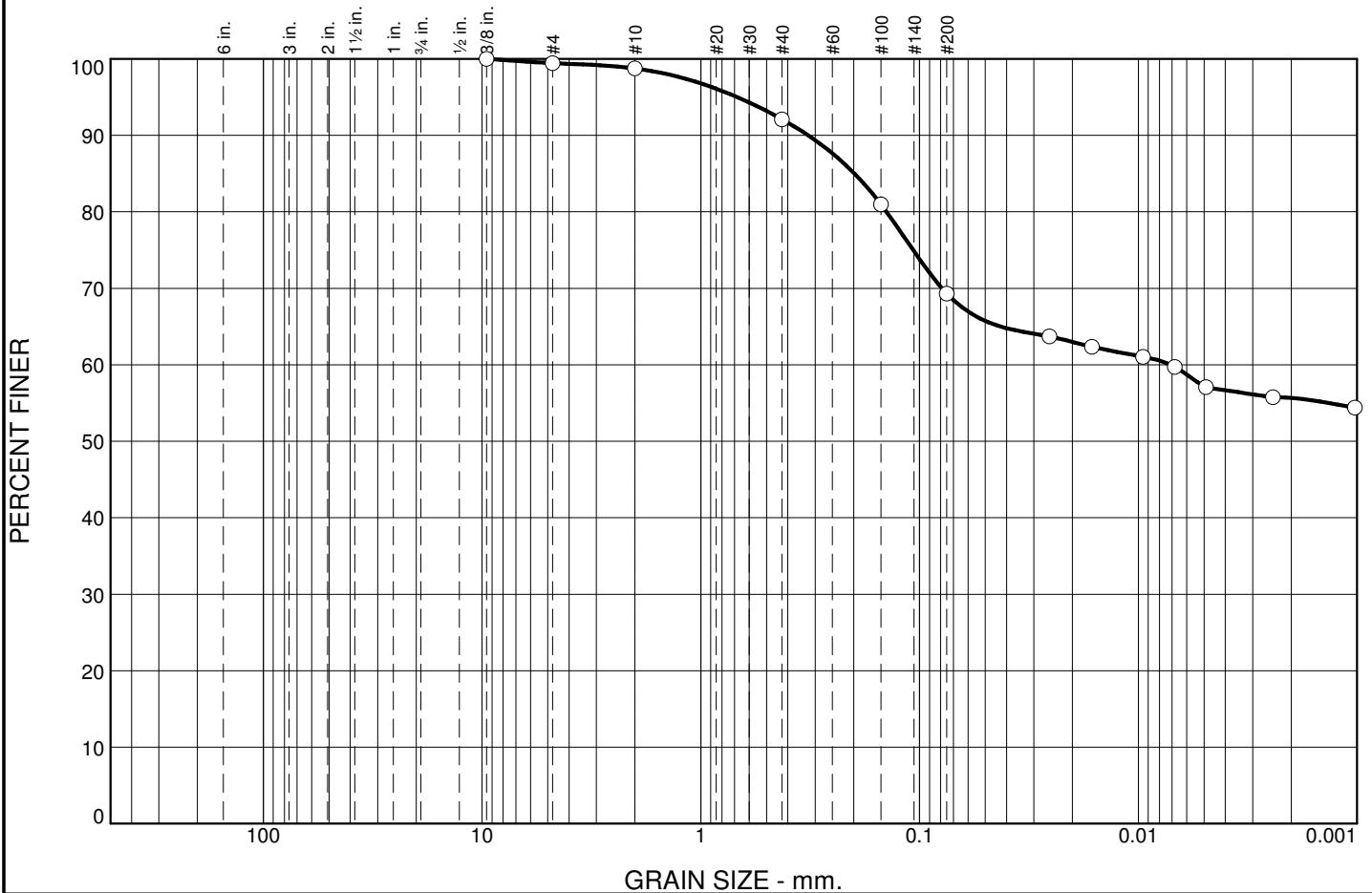
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9706

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.6	30.1	12.1	57.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.4		
#10	98.8		
#40	92.1		
#100	81.0		
#200	69.3		

* (no specification provided)

Material Description

USDA Classification: Clay
USDA Fraction: SAND: 33.1% SILT: 10.5% CLAY: 56.4%

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 0.3228 D₈₅= 0.1985 D₆₀= 0.0071
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content: 23.2%

Location: SWM-8

Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

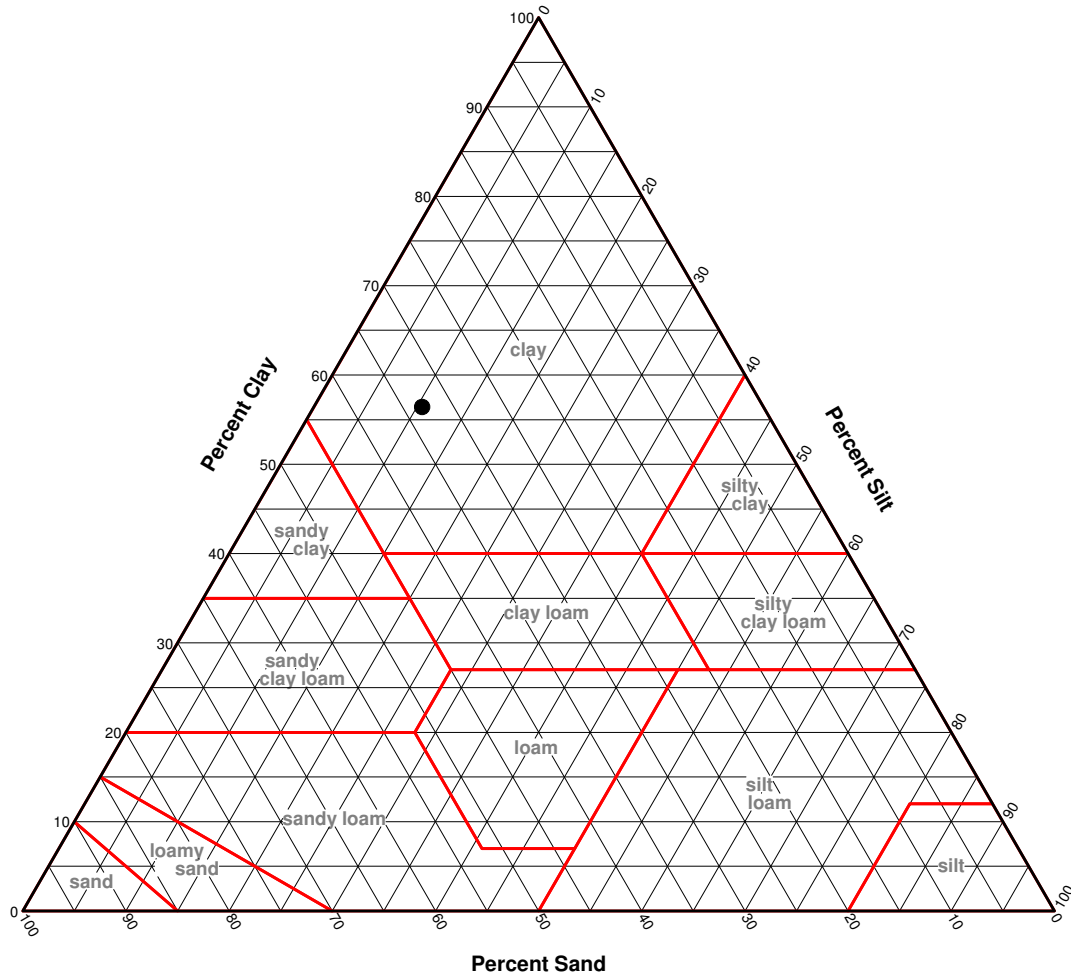
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9707

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9707	S-4	8.5'-10.0'	33.1	10.5	56.4	Clay

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

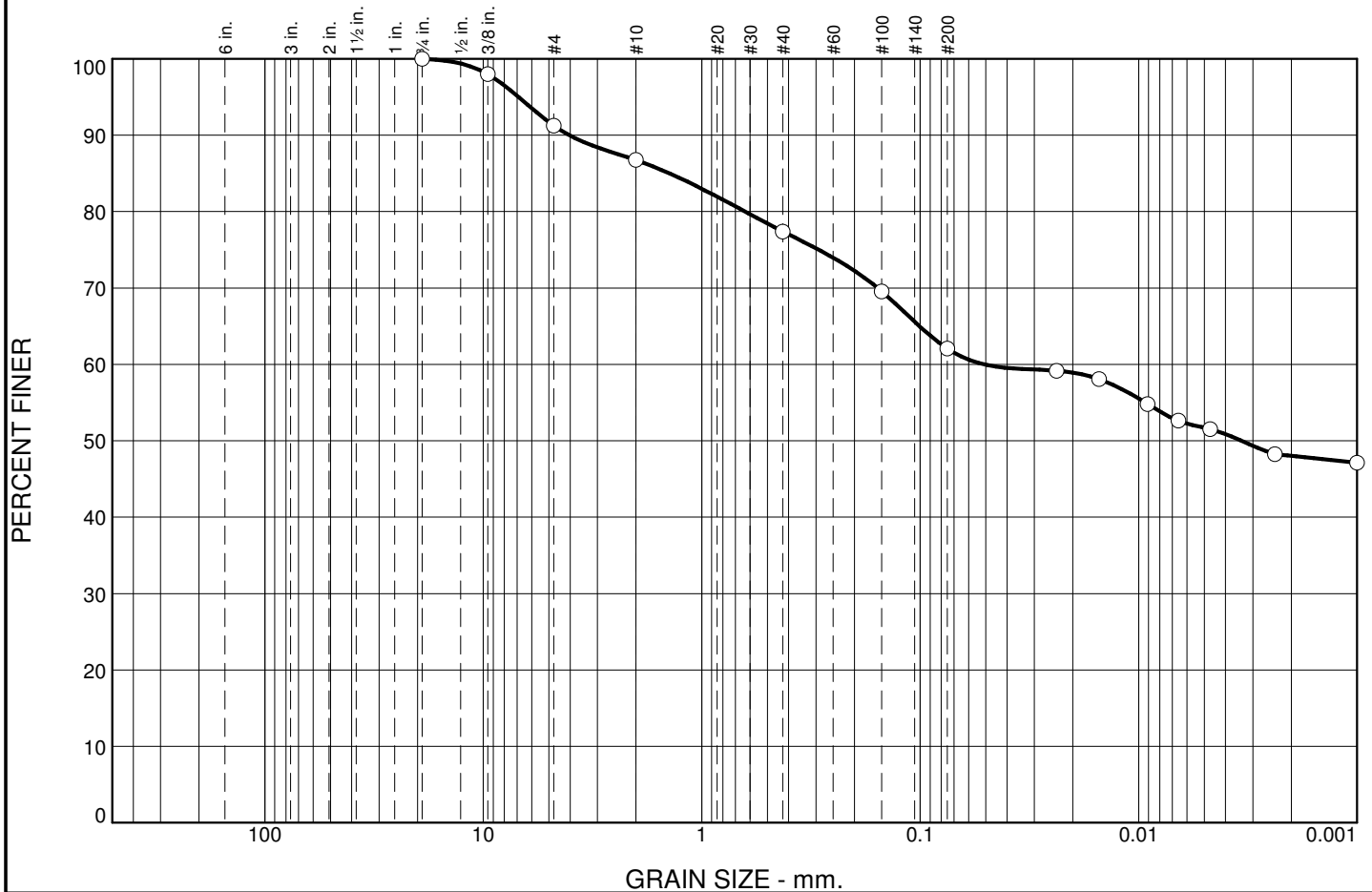
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9707

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	8.8	29.1	10.4	51.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	98.0		
#4	91.2		
#10	86.8		
#40	77.4		
#100	69.6		
#200	62.1		

* (no specification provided)

Material Description

USDA Classification: Clay
USDA Fraction: SAND: 30.8% SILT: 13.9% CLAY: 55.3%

Atterberg Limits

PL= LL= PI=

Coefficients

D₉₀= 4.0405 D₈₅= 1.4046 D₆₀= 0.0508
D₅₀= 0.0034 D₃₀= C_u= D₁₅=
D₁₀= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content: 20.4%

Location: Swm-10
Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

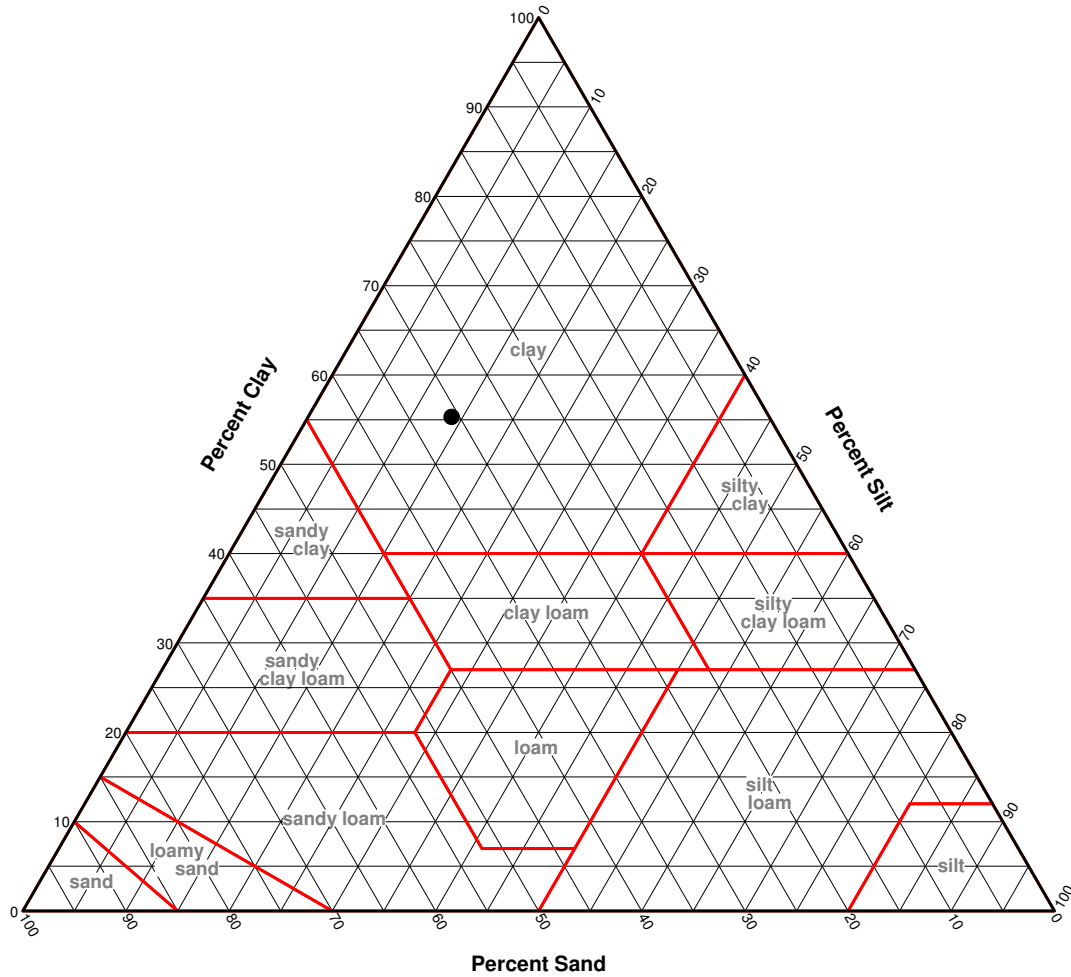
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9708

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9708	S-4	8.5'-10.0'	30.8	13.9	55.3	Clay

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

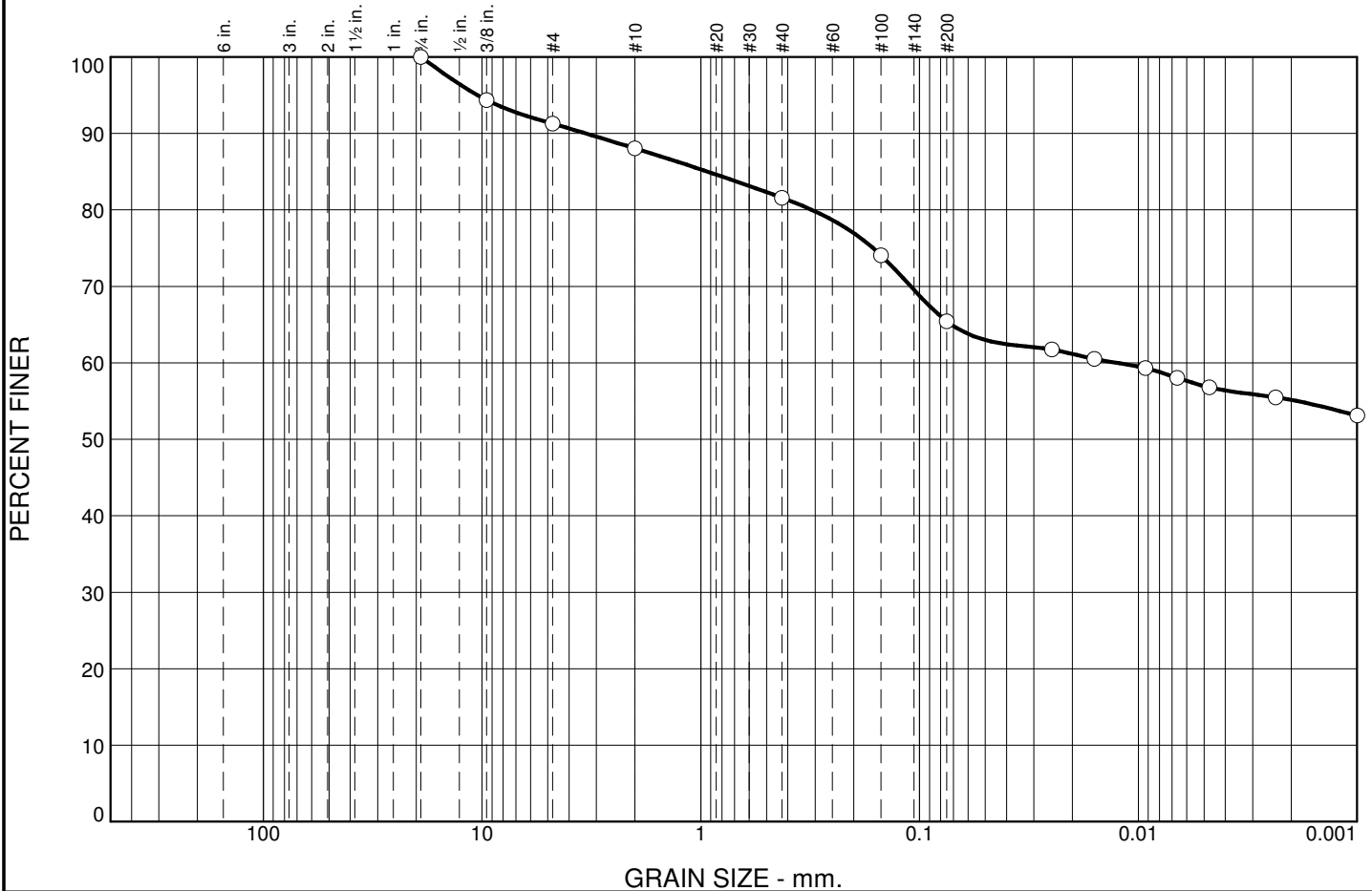
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9708

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	8.7	25.9	8.4	57.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	94.4		
#4	91.3		
#10	88.0		
#40	81.6		
#100	74.1		
#200	65.4		

* (no specification provided)

Material Description

Atterberg Limits
 PL= LL= PI=

Coefficients
 D₉₀= 3.3549 D₈₅= 0.9308 D₆₀= 0.0125
 D₅₀= D₃₀= D₁₅=
 D₁₀= C_u= C_c=

Classification
 USCS= AASHTO=

Remarks
 Moisture Content: 27.2%

Location: Swm-11
 Sample Number: S-4

Depth: 8.5'-10.0'

Date: 09-20-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

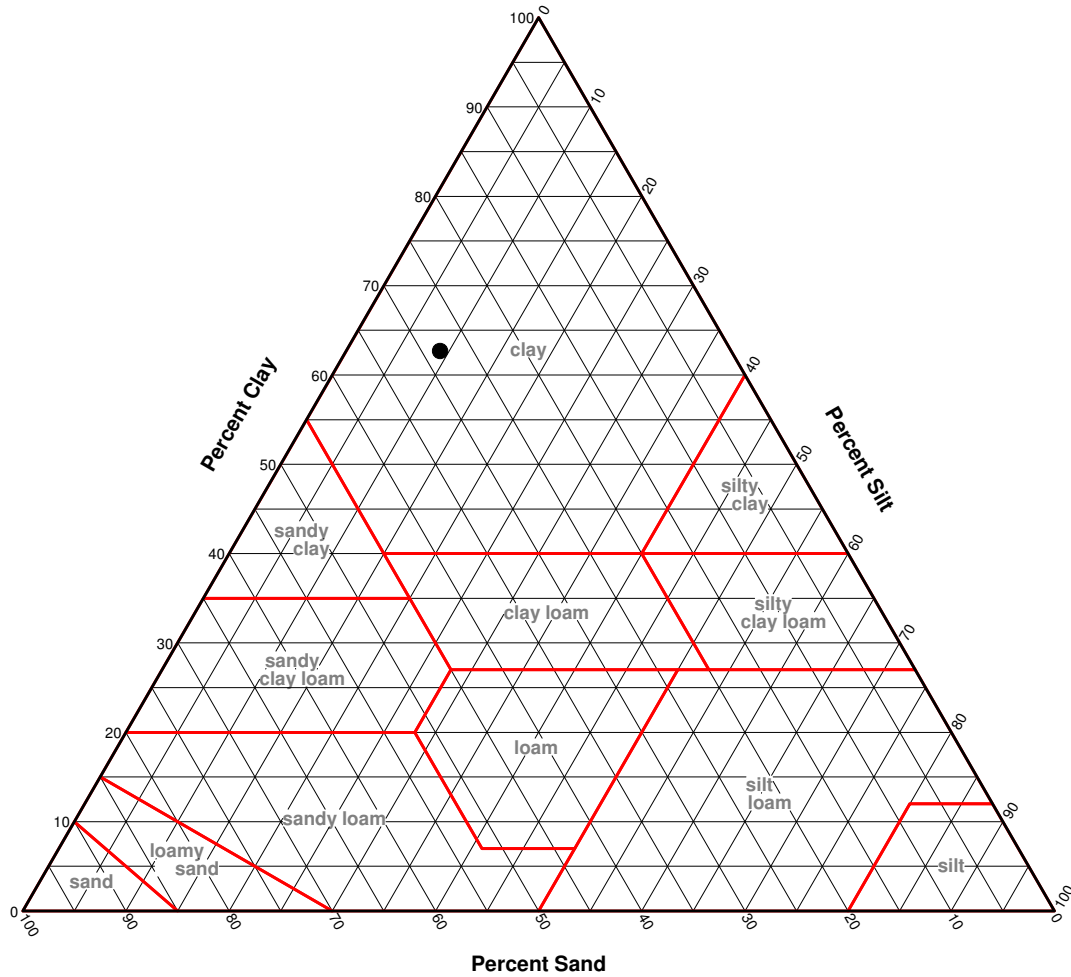
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No: 19418A

Figure #9709

USDA Soil Classification



SOIL DATA

	Source	Sample No.	Depth	Percentages From Material Passing a #10 Sieve			Classification
				Sand	Silt	Clay	
●	#9709	S-4	8.5'-10.0'	28.2	9.1	62.7	Clay

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

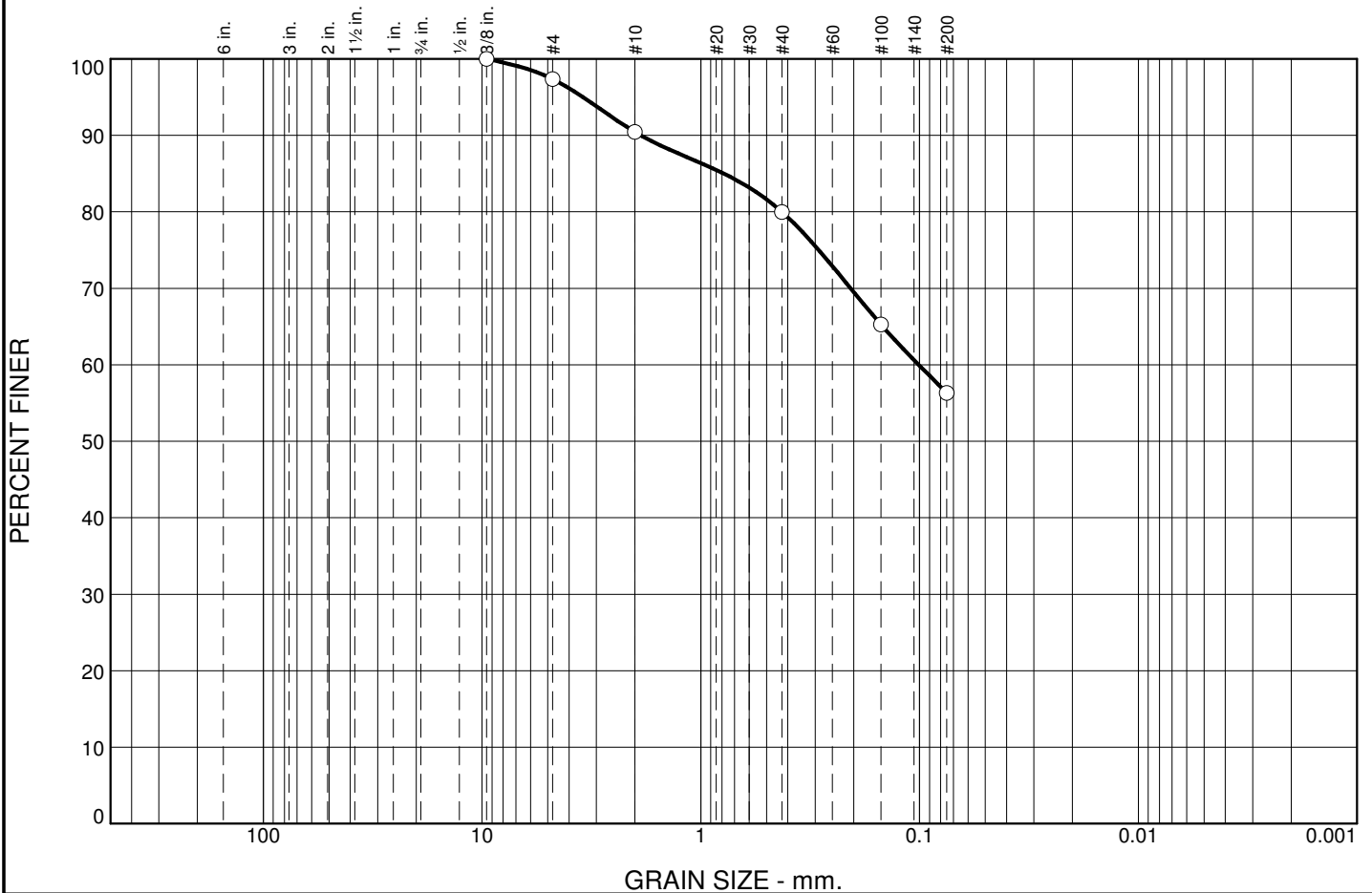
Client: GWWO Inc. Architects

Project: Waverley Area ES

Project No.: 19418A

Figure #9709

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	2.7	41.0	56.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	97.3		
#10	90.5		
#40	80.0		
#100	65.3		
#200	56.3		

* (no specification provided)

Material Description

Reddish brown sandy Lean CLAY, trace rock fragments

Atterberg Limits

PL= 24

LL= 40

PI= 16

Coefficients

D₉₀= 1.8776

D₈₅= 0.7861

D₆₀= 0.1010

D₅₀=

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= CL

AASHTO= A-6(7)

Remarks

Moisture Content: 12.7%

Location: P-2

Date: 09-11-19

HILLIS-CARNES ENGINEERING ASSOCIATES

Client: GWWO Inc. Architects

Project: Waverley Area ES

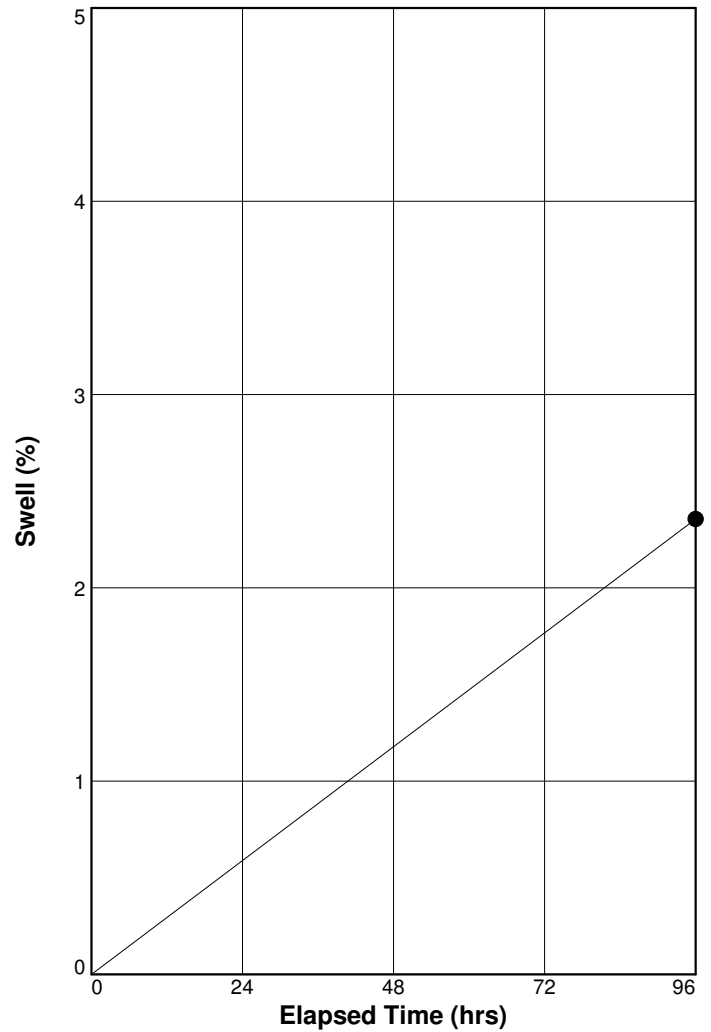
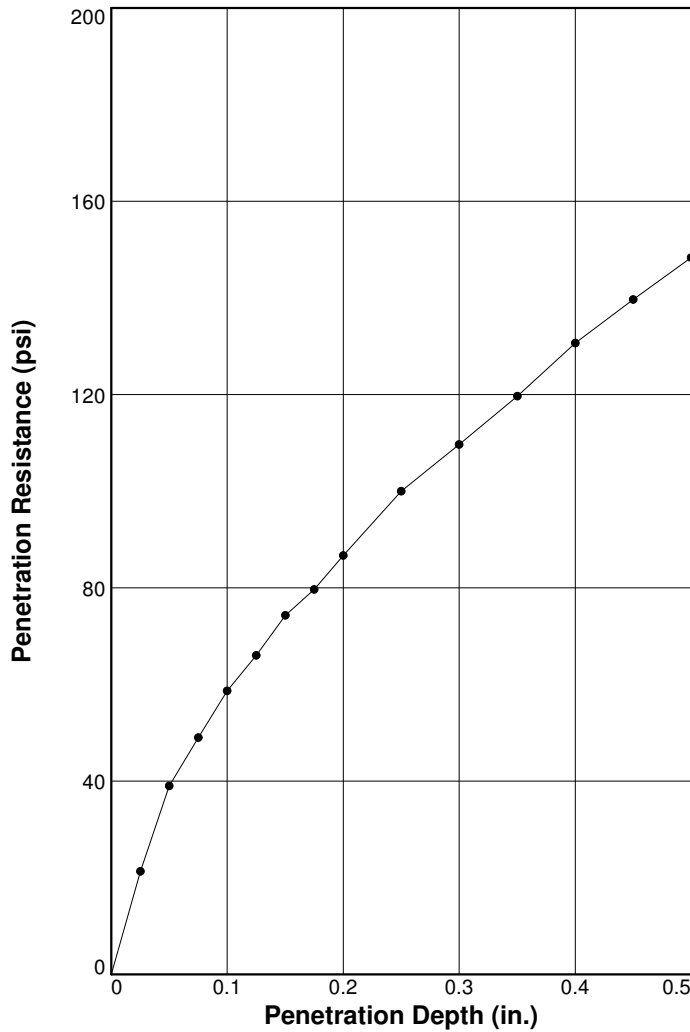
FREDERICK, MD

Project No: 19418A

Figure #9710

BEARING RATIO TEST REPORT

ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	106.6	96	17.1	104.1	93.8	23.3	5.9	5.8	0.000	10	2.4
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Reddish brown sandy Lean CLAY, trace rock fragments							CL	111.0	17.1	40	16

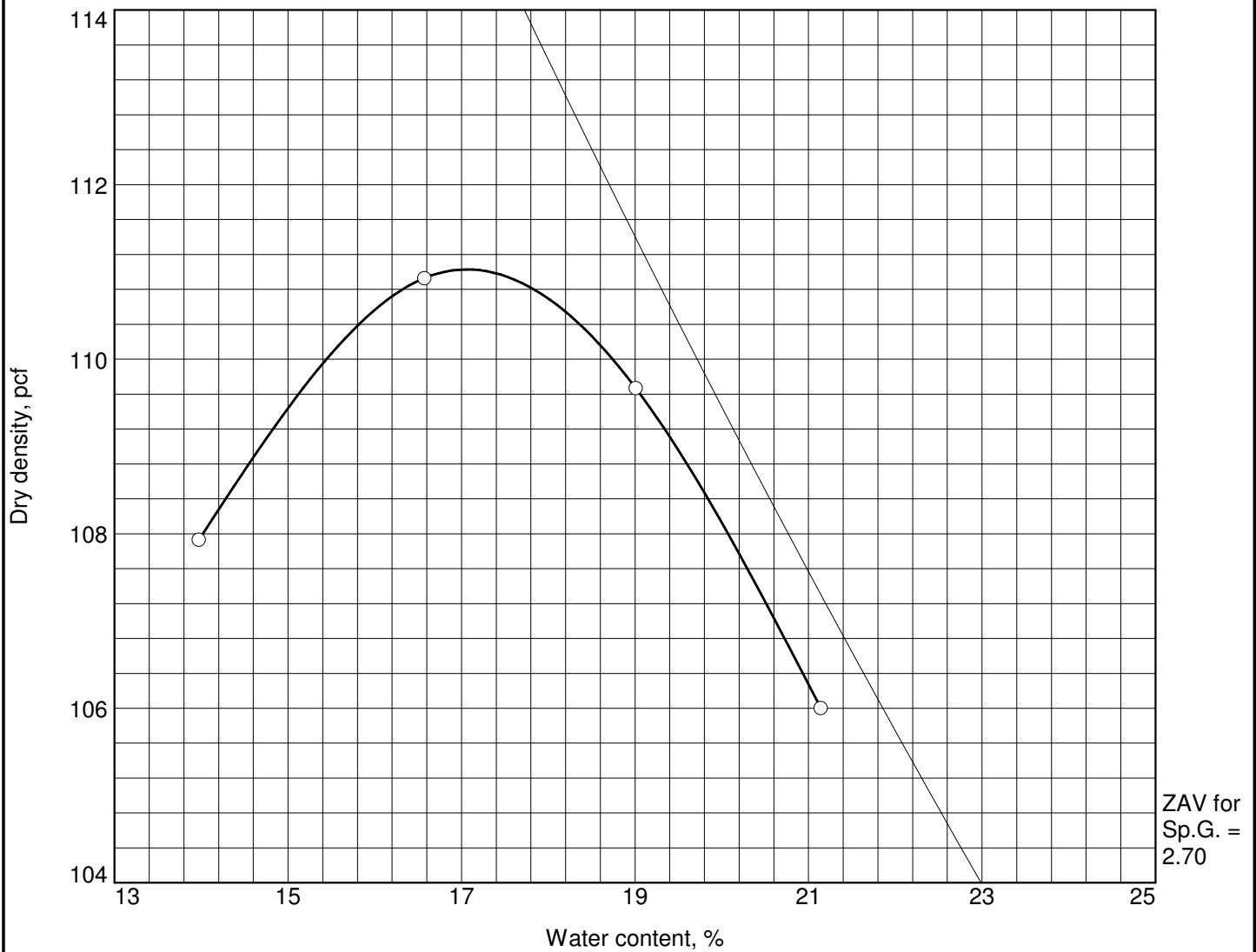
Project No: 19418A
Project: Waverley Area ES
Location: P-2
Date: 09-11-19

Test Description/Remarks:

BEARING RATIO TEST REPORT
HILLIS-CARNES ENGINEERING ASSOCIATES

Figure #9710

Moisture-Density Relationship



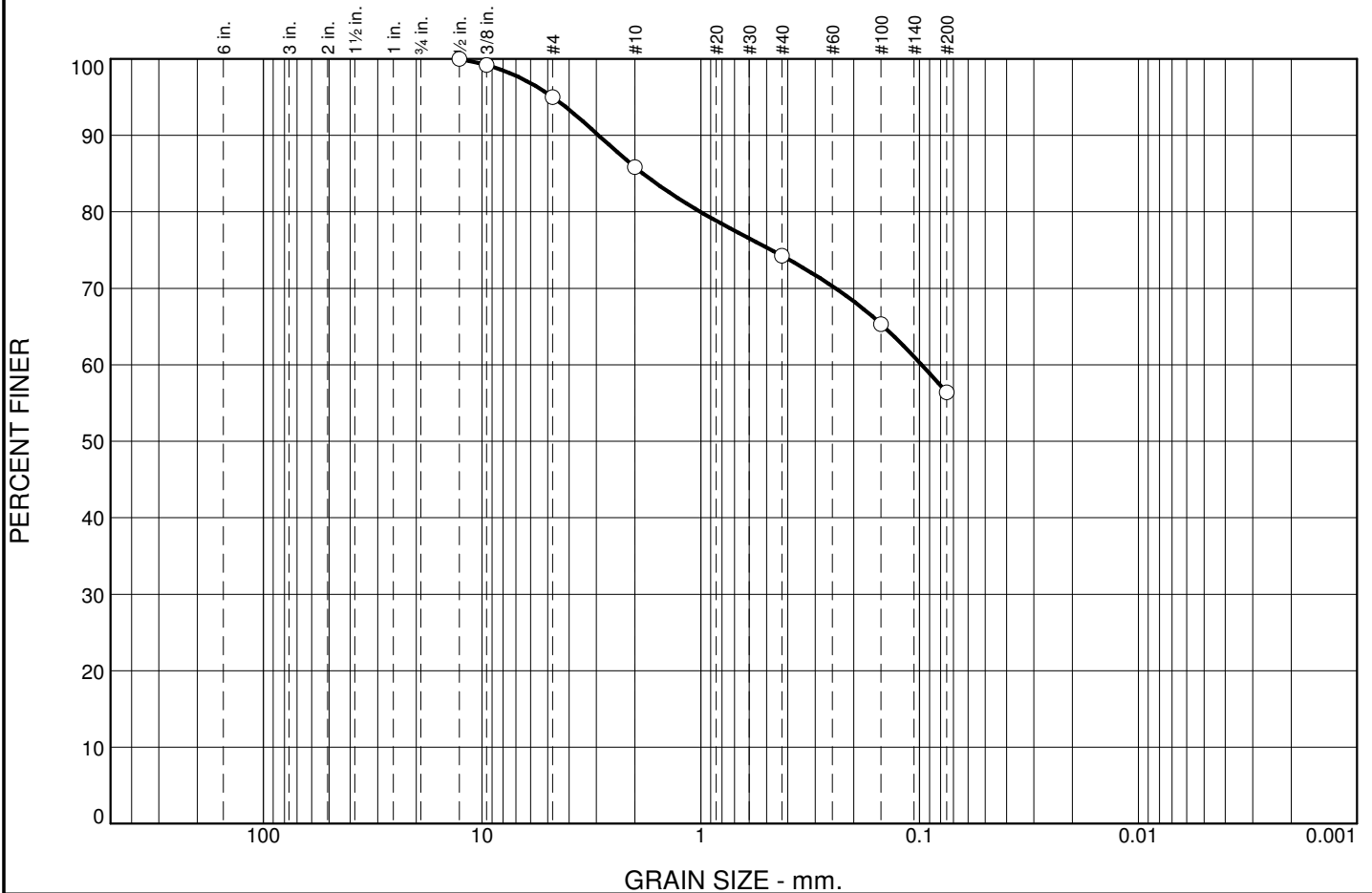
Test specification: AASHTO T 180 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	CL	A-6(7)			40	16	0.0	56.3

TEST RESULTS		MATERIAL DESCRIPTION	
Maximum dry density = 111.0 pcf Optimum moisture = 17.1 %		Reddish brown sandy Lean CLAY, trace rock fragments	
Project No. 19418A Client: GWWO Inc. Architects Project: Waverley Area ES <div>Date: 09-03-19</div> <div>Location: P-2</div>		Remarks:	
<div>HILLIS-CARNES ENGINEERING ASSOCIATES</div> <div>FREDERICK, MD</div>			
		<div>Figure #9710</div>	

Figure #9710

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	5.0	38.6	56.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	99.2		
#4	95.0		
#10	85.9		
#40	74.2		
#100	65.3		
#200	56.4		

* (no specification provided)

Material Description

Brown sandy Lean CLAY, trace rock fragments

Atterberg Limits

PL= 21 LL= 42 PI= 21

Coefficients

D₉₀= 2.9318 D₈₅= 1.8348 D₆₀= 0.0978
D₅₀= D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(9)

Remarks

Moisture Content: 8.6%

Location: P-5

Date: 09-17-19

HILLIS-CARNES ENGINEERING ASSOCIATES

FREDERICK, MD

Client: GWWO Inc. Architects

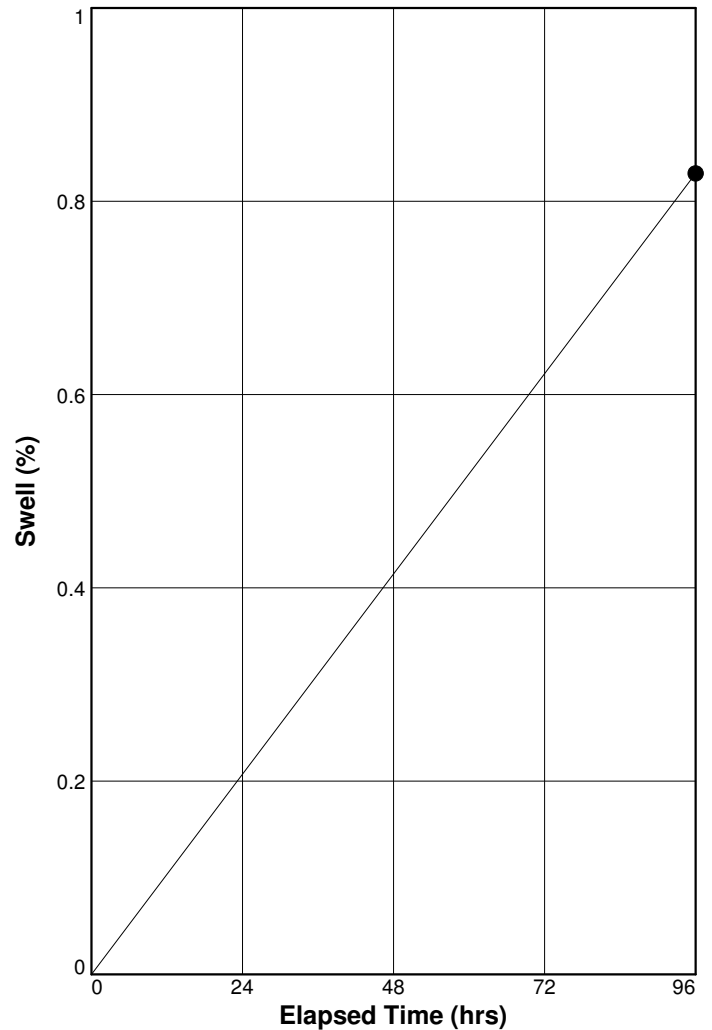
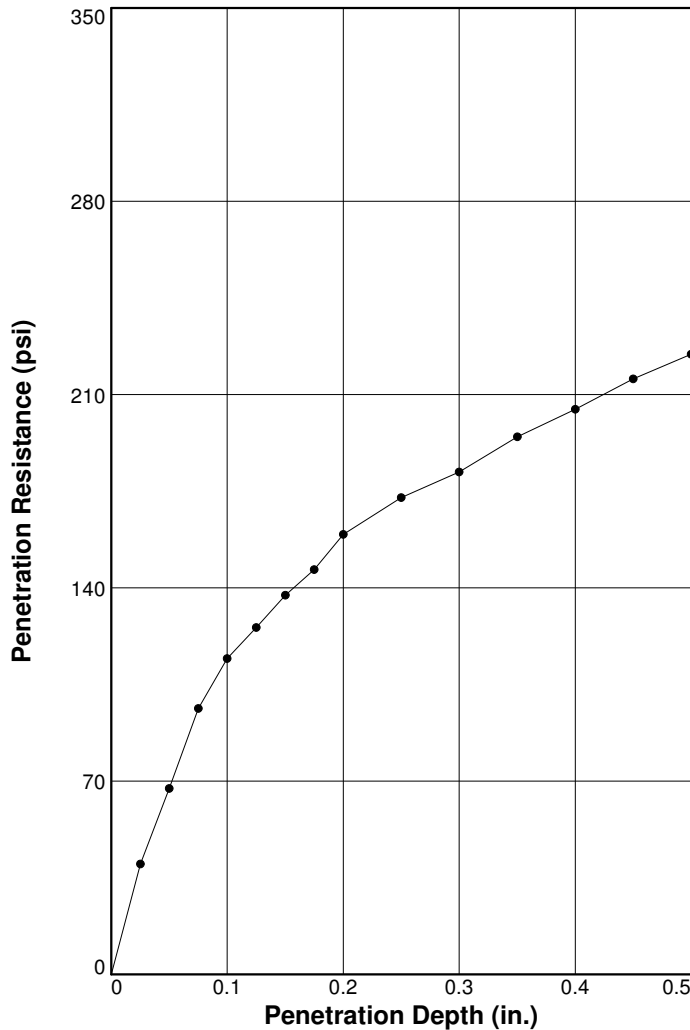
Project: Waverley Area ES

Project No: 19418A

Figure #9711

BEARING RATIO TEST REPORT

ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	112.7	97	15.3	111.8	96.2	17.1	11.4	10.6	0.000	10	0.8
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown sandy Lean CLAY, trace rock fragments							CL	116.2	14.2	42	21

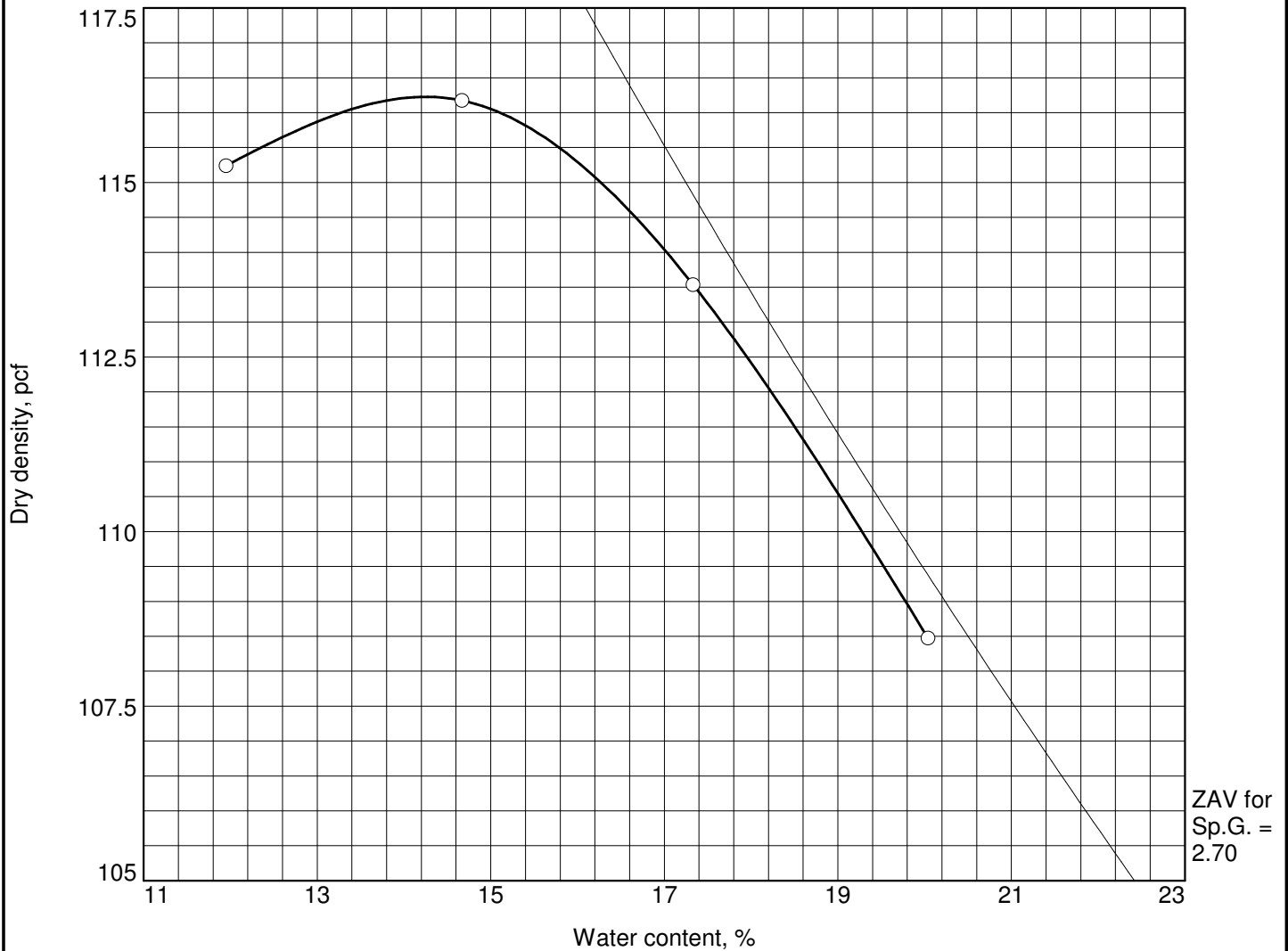
Project No: 19418A
Project: Waverley Area ES
Location: P-5
Date: 09-17-19

Test Description/Remarks:

BEARING RATIO TEST REPORT
HILLIS-CARNES ENGINEERING ASSOCIATES

Figure #9711

Moisture-Density Relationship



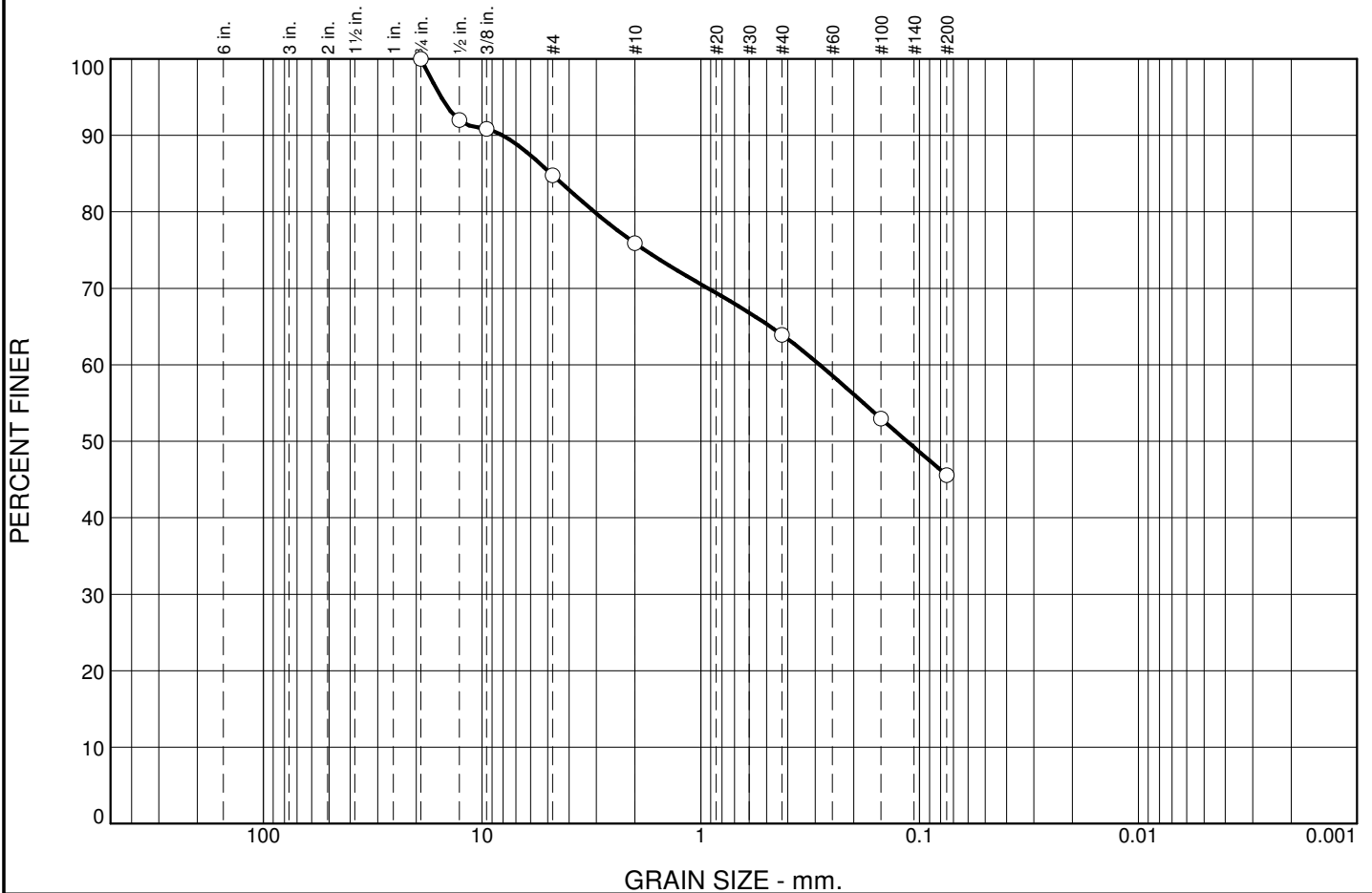
Test specification: AASHTO T 180 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	CL	A-7-6(9)			42	21	0.0	56.4

TEST RESULTS		MATERIAL DESCRIPTION	
Maximum dry density = 116.2 pcf Optimum moisture = 14.2 %		Brown sandy Lean CLAY, trace rock fragments	
Project No. 19418A Client: GWWO Inc. Architects Project: Waverley Area ES <div>Date: 09-10-19</div> Location: P-5		Remarks:	
<div>HILLIS-CARNES ENGINEERING ASSOCIATES</div> <div>FREDERICK, MD</div>			
		<div>Figure #9711</div>	

Figure #9711

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	15.2	39.2	45.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	92.0		
0.375	90.8		
#4	84.8		
#10	75.9		
#40	63.9		
#100	53.0		
#200	45.6		

* (no specification provided)

Material Description

Brown Silty SAND with rock fragments

Atterberg Limits

PL= NP

LL= NP

PI= NP

Coefficients

D₉₀= 8.0517

D₈₅= 4.8448

D₆₀= 0.2855

D₅₀= 0.1140

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= SM

AASHTO= A-4(0)

Remarks

Moisture Content: 5.3%

Location: P-7

Date: 09-17-19

HILLIS-CARNES ENGINEERING ASSOCIATES

Client: GWWO Inc. Architects

Project: Waverley Area ES

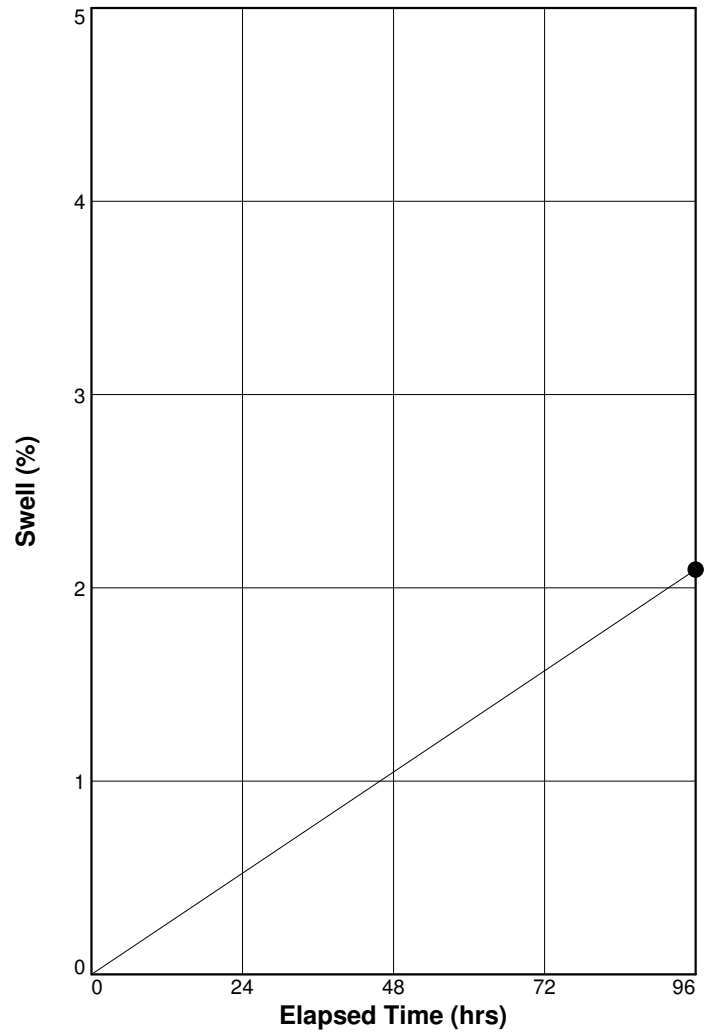
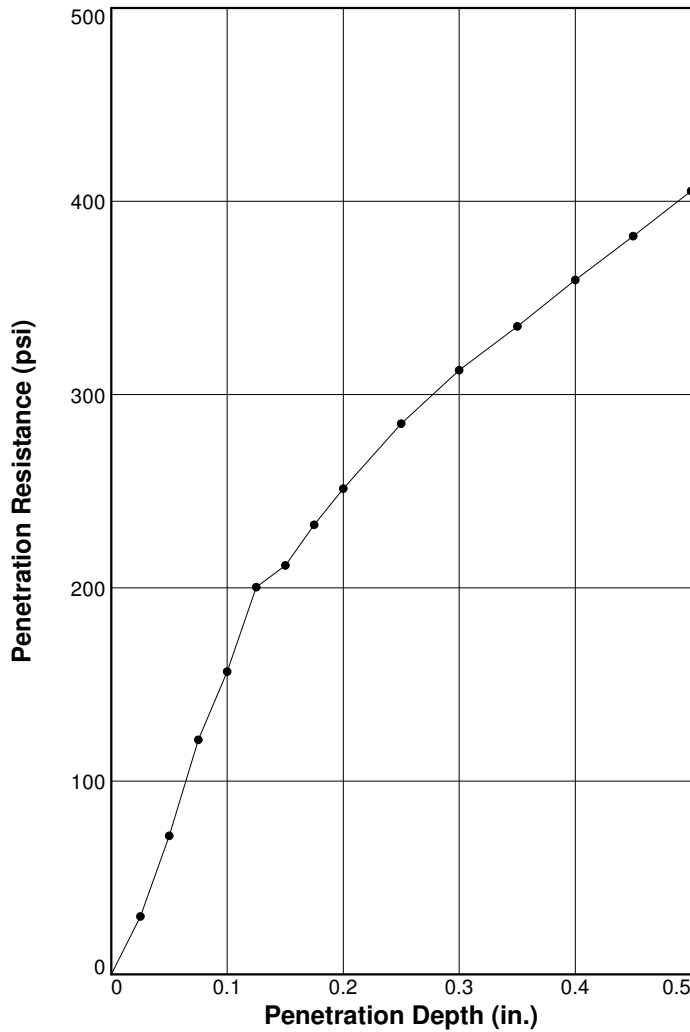
FREDERICK, MD

Project No: 19418A

Figure #9712

BEARING RATIO TEST REPORT

ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	123.1	98.2	11.1	120.6	96.3	13.3	15.7	16.8	0.000	10	2.1
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Silty SAND with rock fragments							SM	125.3	11.5	NP	NP

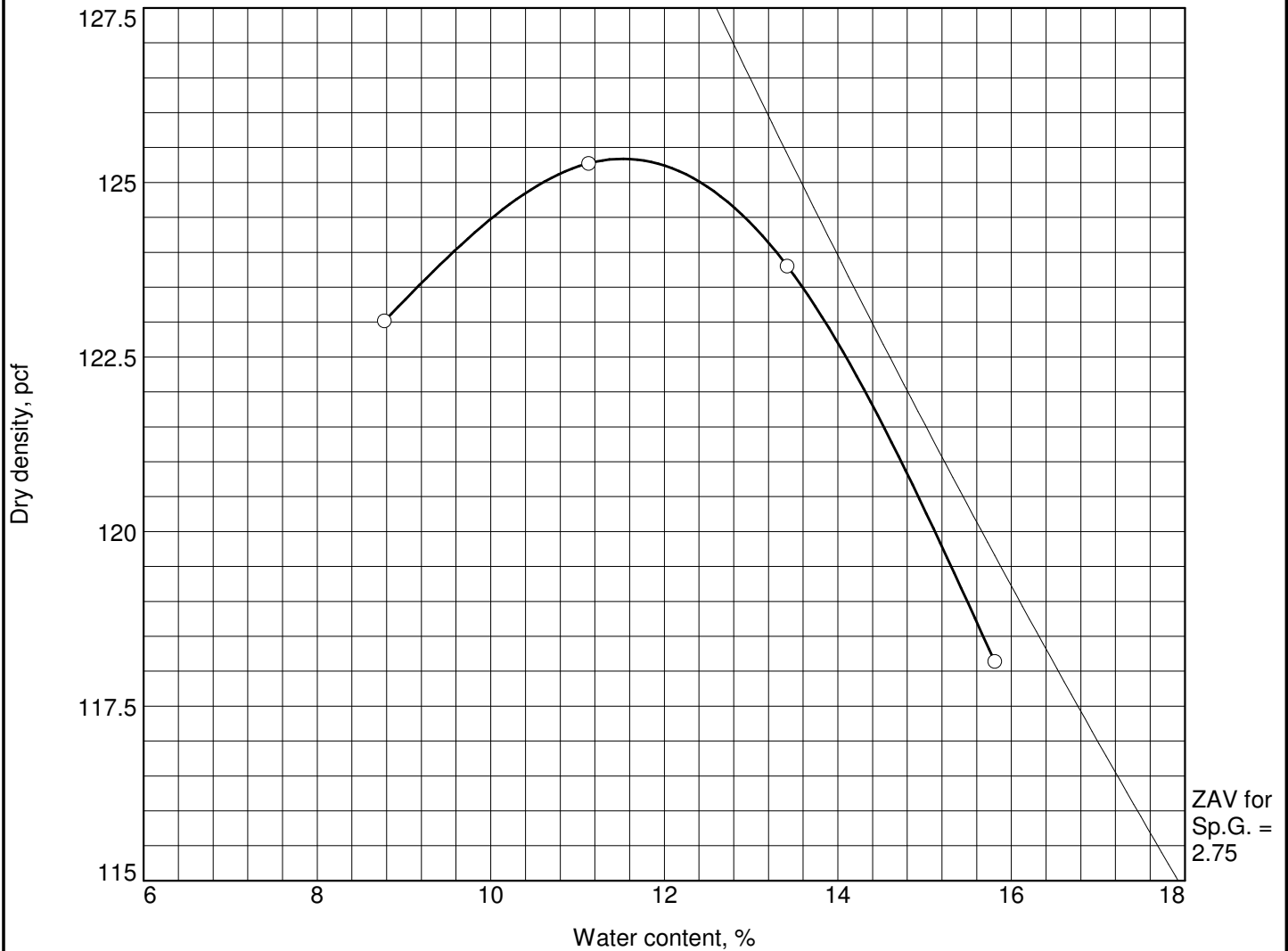
Project No: 19418A
Project: Waverley Area ES
Location: P-7
Date: 09-17-19

Test Description/Remarks:

BEARING RATIO TEST REPORT
HILLIS-CARNES ENGINEERING ASSOCIATES

Figure #9712

Moisture-Density Relationship



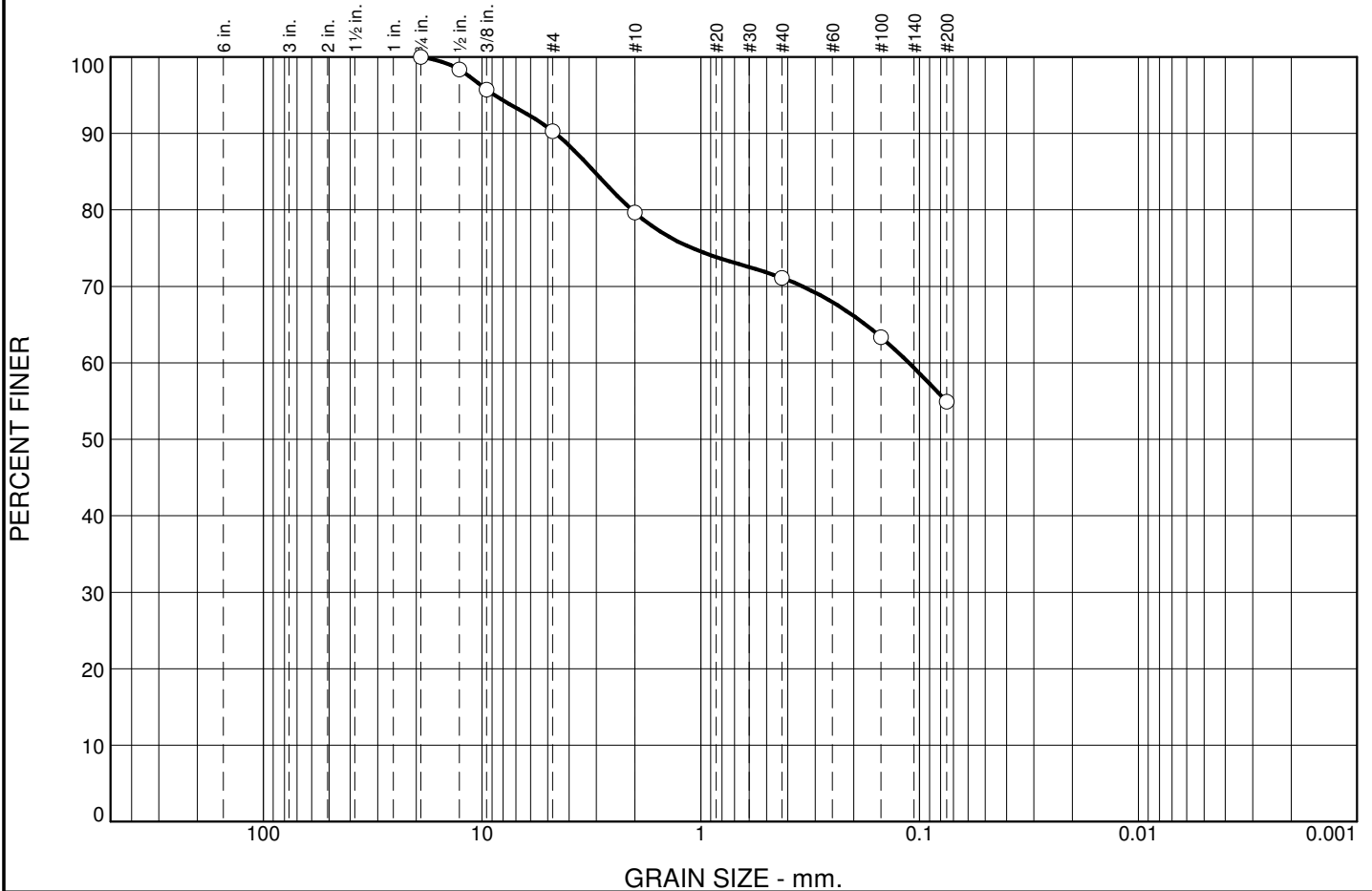
Test specification: AASHTO T 180 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	SM	A-4(0)			NP	NP	0.0	45.6

TEST RESULTS		MATERIAL DESCRIPTION	
Maximum dry density = 125.3 pcf		Brown Silty SAND with rock fragments	
Optimum moisture = 11.5 %			
Project No. 19418A Client: GWWO Inc. Architects Project: Waverley Area ES <div>Date: 09-10-19</div> <div>○ Location: P-7</div>		Remarks:	
<div>HILLIS-CARNES ENGINEERING ASSOCIATES</div> <div>FREDERICK, MD</div>			
		Figure #9712	

Figure #9712

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	9.7	35.4		54.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	98.4		
0.375	95.7		
#4	90.3		
#10	79.6		
#40	71.1		
#100	63.4		
#200	54.9		

* (no specification provided)

Material Description

Brown sandy Lean CLAY, trace rock fragments

Atterberg Limits

PL= 20

LL= 39

PI= 19

Coefficients

D₉₀= 4.6150

D₈₅= 3.0651

D₆₀= 0.1119

D₅₀=

D₃₀=

D₁₅=

D₁₀=

C_u=

C_c=

Classification

USCS= CL

AASHTO= A-6(8)

Remarks

Moisture Content: 9.2%

Location: P-9

Date: 09-17-19

HILLIS-CARNES ENGINEERING ASSOCIATES

Client: GWWO Inc. Architects

Project: Waverley Area ES

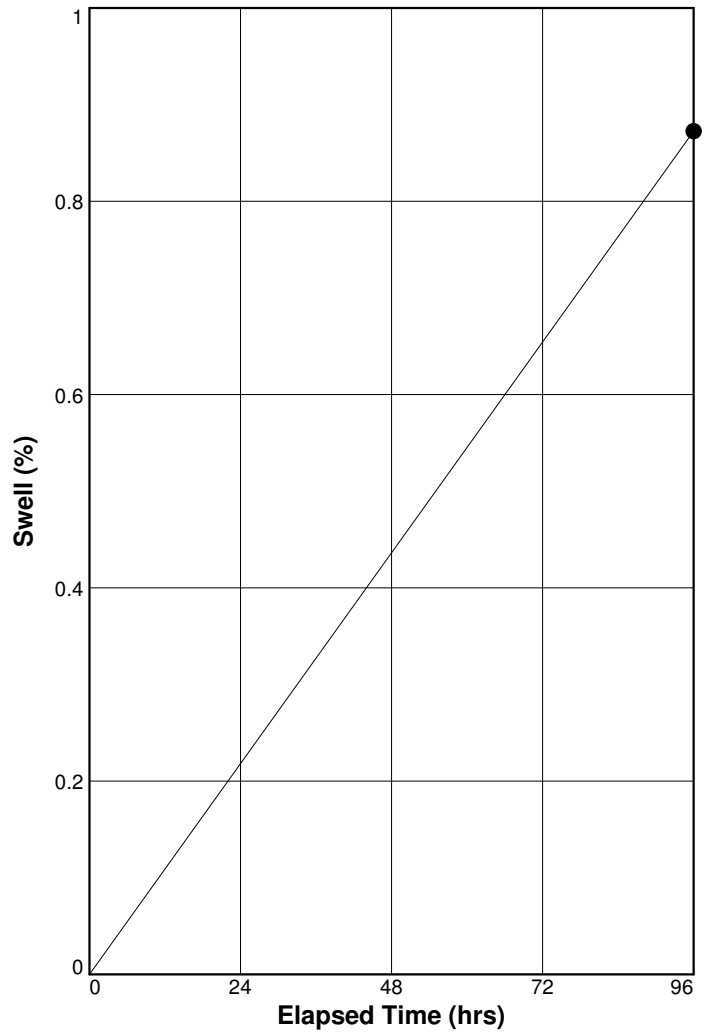
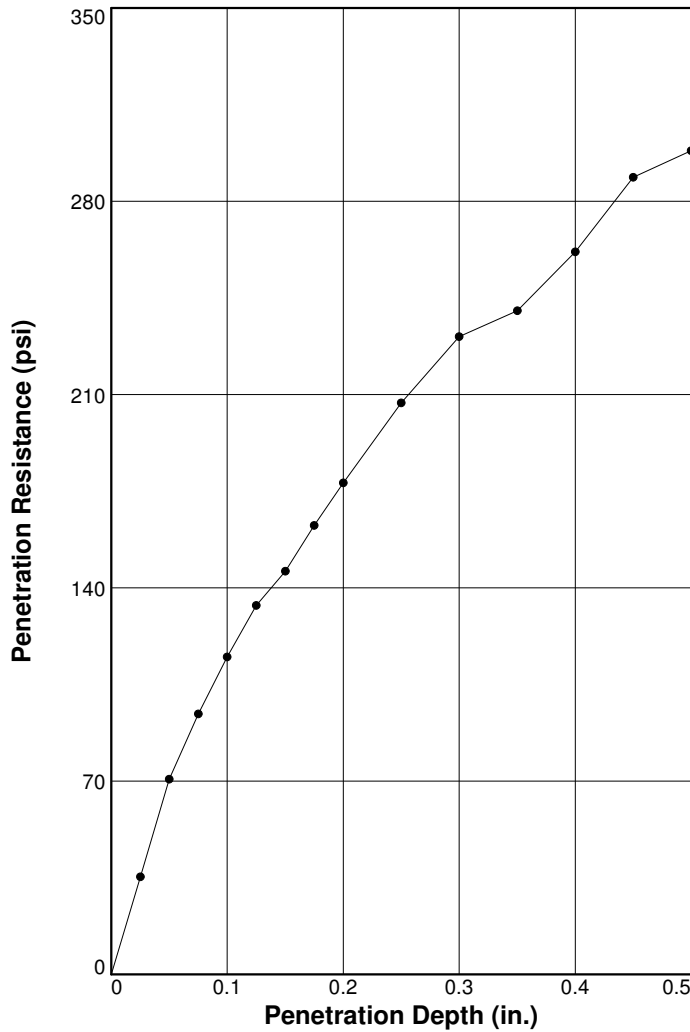
FREDERICK, MD

Project No: 19418A

Figure #9713

BEARING RATIO TEST REPORT

ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	120.6	97.4	10.3	119.6	96.6	16.3	11.5	11.9	0.000	10	0.9
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown sandy Lean CLAY, trace rock fragments							CL	123.8	10.5	39	19

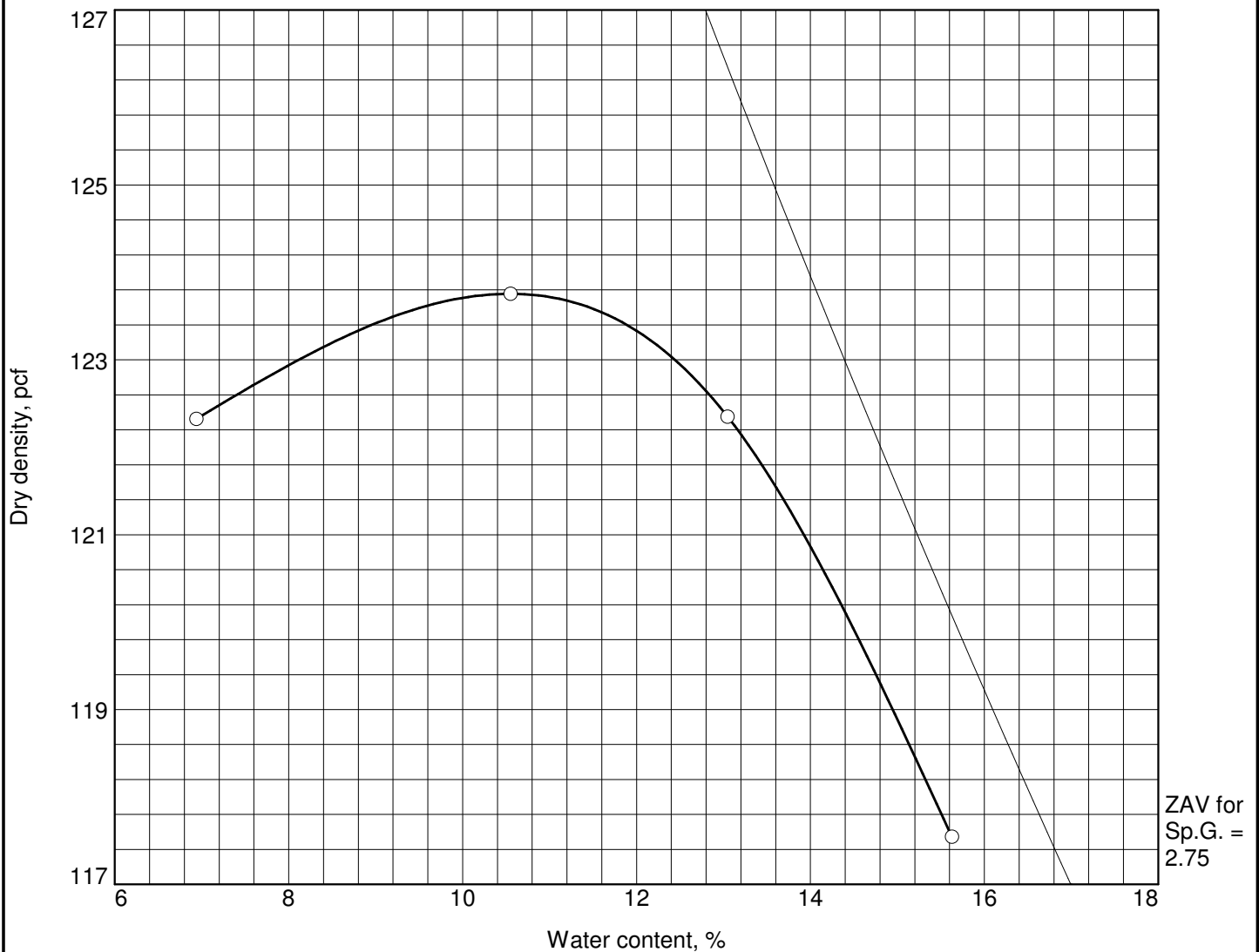
Project No: 19418A
Project: Waverley Area ES
Location: P-9
Date: 09-17-19

Test Description/Remarks:

BEARING RATIO TEST REPORT
HILLIS-CARNES ENGINEERING ASSOCIATES

Figure #9713

Moisture-Density Relationship



Test specification: AASHTO T 180 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
	CL	A-6(8)			39	19	0.0	54.9

TEST RESULTS		MATERIAL DESCRIPTION
Maximum dry density = 123.8 pcf Optimum moisture = 10.5 %		Brown sandy Lean CLAY, trace rock fragments
Project No. 19418A Client: GWWO Inc. Architects Project: Waverley Area ES <div>Date: 09-10-19</div> <div>○ Location: P-9</div>		Remarks:
HILLIS-CARNES ENGINEERING ASSOCIATES 		

Figure #9713

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:35 AM	70 1/16	-	-	-
8:05 AM	70 ¼	½	3/16	0.375
8:35 AM	70 ¼	½	0	0
9:05 AM	70 ¼	½	0	0
9:35 AM	70 3/8	½	1/8	0.25
10:05 AM	70 3/8	½	0	0
10:35 AM	70 3/8	½	0	0
11:05 AM	70 7/16	½	1/16	0.125
11:35 AM	70 7/16	½	1/16	0

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0.05 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

**LOG NO.
SWM-1**

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:25 AM	68 ½	-	-	-
7:55 AM	68 5/8	½	1/8	0.25
8:25 AM	68 ¾	½	1/8	0.25
8:55 AM	68 7/8	½	1/8	0.25
9:25 AM	68 15/16	½	1/16	0.125
9:55 AM	69 1/8	½	3/16	0.375
10:25 AM	69 ¼	½	1/8	0.25
10:55 AM	69 5/16	½	1/16	0.125
11:25 AM	69 7/16	½	1/8	0.25

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0.2 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

**LOG NO.
SWM-10**

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:30 AM	68 5/16	-	-	-
8:00 AM	70 ½	½	2 1/5	4.375
8:30 AM	71 15/16	½	1 7/16	2.875
9:00 AM	72 5/8	½	11/16	1.375
9:30 AM	73 1/8	½	½	0.5
10:00 AM	73 7/16	½	5/16	0.625
10:30 AM	73 5/8	½	3/16	0.375
11:00 AM	73 ¾	½	1/8	0.25
11:30 AM	73 15/16	½	3/16	0.375

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0.53 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

LOG NO.
SWM-11

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:50 AM	64 9/16	-	-	-
8:20 AM	68 ¼	½	11/16	1.375
8:50 AM	69 7/8	½	1 5/8	3.25
9:20 AM	70 ¾	½	7/8	1.75
9:50 AM	71 1/8	½	3/8	0.75
10:20 AM	71 3/8	½	¼	0.5
10:50 AM	71 ½	½	1/8	0.25
11:20 AM	71 11/16	½	3/16	0.375
11:50 AM	71 7/8	½	3/16	0.375

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0.45 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

LOG NO.
SWM-4

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:45 AM	68 ¼	-	-	-
8:15 AM	68 ¼	½	0	0
8:45 AM	68 ¼	½	0	0
9:15 AM	68 ¼	½	0	0
9:45 AM	68 3/8	½	1/8	0.25
10:15 AM	68 7/16	½	1/16	0.125
10:45 AM	68 7/16	½	0	0
11:15 AM	68 7/16	½	0	0
11:45 AM	68 7/16	½	0	0

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

**LOG NO.
SWM-6**

TIME OF READING	DEPTH TO WATER, INCHES	TIME CHANGE, HOURS	DEPTH CHANGE, INCHES	RATE, INCHES/HOUR
7:40 AM	68 1/16	-	-	-
8:10 AM	68 ¼	½	3/16	0.375
8:40 AM	68 3/8	½	1/8	0.25
9:10 AM	68 ½	½	1/8	0.25
9:40 AM	68 5/8	½	1/8	0.25
10:10 AM	68 7/8	½	¼	0.5
10:40 AM	68 7/8	½	0	0
11:10 AM	69	½	1/8	0.25
11:40 AM	69 3/16	½	3/16	0.375

Depth of test beneath existing grades 8 feet

Date of test 08/22/2019

Estimated Infiltration Rate: 0.25 in/hr

**HILLIS-CARNES
ENGINEERING ASSOCIATES, INC.**

HCEA Project No.: 19418A

SCALE: NTS

DATE: September 23, 2019

Infiltration Test Log
Waverley Elementary School - SWM

**LOG NO.
SWM-8**

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building demolition excluding removal of hazardous materials and toxic substances.
- B. Selective demolition of built site elements.

1.2 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- C. Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1: Additional salvage and waste management requirements.
- D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- G. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- H. Section 02 3200 - Geotechnical Investigation: Fill material for filling holes, pits, and excavations under the new building generated as a result of removal operations.
- I. Section 31 2000 - Earthmoving: Fill material for filling holes, pits, and excavations not under the new building generated as a result of removal operations.

1.3 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- B. Code of Maryland Regulations (COMAR) Title 26 - Department of the Environment; current edition.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.

- 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
- E. Photos: Submit photos of the pre-demolition conditions.
- F. Salvage Inventory: Accurately record inventory of salvaged materials from each existing building noted in the attachment to this section.
- G. Statement of Refrigerant Recovery.
- H. Maryland Department of the Environment (MDE) Documentation.
 - 1. See Section 01 7800 - Closeout Submittals, for closeout procedures.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of three years of documented experience.
- B. Refrigerant Recovery Technician Qualifications: Company/Representative approved by the Environmental Protection Agency (EPA) Certification Program.
- C. Regulatory Requirements:
 - 1. Comply with governing EPA notifications before beginning demolition.
 - 2. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- E. Pre-Demolition Conference: Conduct conference at project site.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SCOPE

- A. Remove the existing buildings and associated site elements in the sequence outlined on the Drawings, including below grade construction within the LOD such as basements, utilities, foundation walls and all footings..
- B. Remove paving and curbs as required to accomplish new work.
- C. Remove all other paving and curbs within construction limits indicated on drawings.
- D. Remove underground tanks.

- E. Remove fences and gates.
- F. Remove other items indicated, for salvage and recycling.
 - 1. Salvage and clearly sort 250 bricks from each of the two existing buildings.
- G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Sections 02 3200 and 31 2000.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- F. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- I. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Comply with requirements of Section 01 7419 - Construction Waste Management and Disposal.
 2. Dismantle existing construction and separate materials.
 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
1. Curb and sidewalk paving is to be removed to the nearest control joint.
 2. Sawcut asphalt conditions.

3.3 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site. Demolished materials cannot be stored onsite.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 Construction Waste Management and Disposal.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

3.5 SALVAGE LIST (BEGINS ON NEXT PAGE)

DEPARTMENT	ITEM DESCRIPTION	LOCATION		QUANTITY	MODEL NUMBER (IF APPLICABLE)	NOTES
		BUILDING	AREA			
SECURITY	Analog Security Cameras	WAVES	Office, Main Hall, various exterior locations	21		FCPS Security will remove all CCTV related equipment as soon as the building is permanently closed.
	Altronix 16 pos power supply	WAVES	MDF in Media Center	1		
	Altronix 16 pos power supply	WAVES	Located in portable 9 in equipment box	1		
	Analog Digital Recording Device	WAVES	MDF in Media Center	1		
	Analog Digital Recording Device	WAVES	Located in portable 9 in equipment box	1		
	CCTV Equipment box	WAVES	Located in portable 9 in equipment box	1		
	Uninterrupted Power Supply	WAVES	Located in portable 9 in equipment box	1		
	Alertus Beacon and Panic Button	WAVES	Front Office - wall mounted	1 each		FCPS Security will remove Alertus equipment as soon as the building is permanently closed.
	Motorola 800 Mhz Emergency Radio & charger	WAVES	Front Office	1	XTS 1500	Radio will be collected by SEMD and repurposed.
	Analog Security Cameras	RCS	Lobby, Office, 9 exterior locations	11		FCPS Security will remove all CCTV related equipment as soon as the building is permanently closed.
	Altronix 16 pos power supply	RCS	Switch rack in front office	1		
	Analog Digital Recording Device	RCS	Switch rack in front office	1		
	Alertus Beacon and Panic Button	RCS	Front Office - wall mounted	1 each		FCPS Security will remove Alertus equipment as soon as the building is permanently closed.
	Motorola 800 Mhz Emergency Radio & charger	RCS	Front Office	1	XTS 1500	Radio will be collected by SEMD and repurposed.
	Serving lines w/Cashier stand	WAVES		2		NOT FOR SALE; store at warehouse
	Flavorhold Tall Warmer Box	WAVES		1		
	Refrigerator/Freezer Shelving	WAVES		ALL		Move to Frederick High School
FOOD SERVICE	Washing Machine	WAVES		1		
	Victory 2 door Reach in Cooler	WAVES		1		
	Southbend Convection Oven-GAS	WAVES		1		
	Budgett Convection Oven	WAVES		1		
	Southbend Double Steamer-GAS	WAVES		1		
	Milk Coolers	WAVES		2		NOT FOR SALE; store at warehouse
	Clothes Dryer	WAVES		1		Sell on Government Deals
	Cres Cor Small Warmer	WAVES		1		Store at warehouse or Frederick High
	Dishwasher???	WAVES				
	Serving line w/Cashier stand	RCS		1		NOT FOR SALE; store at warehouse
	Double Side Reach in Freezer	RCS		1		
	Convection Oven	RCS		1		Sell on Government Deals
	Ice Cream Freezer	RCS		1		
	Double Side Reach in Cooler	RCS		1		
	Milk Cooler	RCS		1		NOT FOR SALE; store at warehouse

DEPARTMENT	ITEM DESCRIPTION	LOCATION		QUANTITY	MODEL NUMBER (IF APPLICABLE)	NOTES
		BUILDING	AREA			
LOCK SHOP	Dishwasher???	RCS				
	VON DUPRIN PANIC BAR	WAVES	LOADING DOCK AREA	1	99EO	
	VON DUPRIN PANIC BAR	WAVES	COURTYARD	1	99EO	
	VON DUPRIN PANIC BAR	WAVES	NEAR PLAYGROUND	1	99EO	
	VON DUPRIN PANIC BAR	WAVES	ENTRANCE/EXTERIOR			
	VON DUPRIN PANIC BAR	WAVES	SECURITY VESTIBULE	4	99EO	
	VON DUPRIN PANIC BAR	WAVES	ACROSS FROM	1	99EO	
	VON DUPRIN PANIC BAR	WAVES	COURTYARD			
	VON DUPRIN HANDLES	WAVES	HOOKED TO VD PANIC	8	VR910	
	PANIC BARS	WAVES	BARS			
	PANIC BARS	WAVES	ALL PORTABLES	ALL		
	DON-JO WRAP AROUND	WAVES	CLASSROOM DOORS	ALL		
	BEST 9K LOCK SETS	WAVES	THROUGHTOUT SCHOOL	ALL	9K	
	BEST CORES	WAVES	IN LOCKSETS	ALL		
	CORBIN PANIC BARS	WAVES	THROUGHTOUT SCHOOL			
	CORBIN PANIC BARS	WAVES	GYM AREA	3		
	YALE PANIC BARS	WAVES	GYM AREA	3		
	SENTRY SAFE	WAVES	STORAGE ROOM NEAR	1	SUPREM 5380	
	PUSH BARS	WAVES	OFFICE			
	VON DUPRIN PANIC BAR	WAVES	VARIOUS LOCATIONS	6		
	VON DUPRIN PANIC BAR	RCS	FRONT LOBBY	4	99EO	
	VON DUPRIN PANIC BAR	RCS	POOL DOOR	1	99EO	
	Corbin Russwin	RCS	THROUGHTOUT SCHOOL	12		
	Mag Locks	RCS	ROOM 22 AND 18 WITH	2		
MAINTENANCE	Loddydock Door	RCS	BEST SWITCH			
	Loddydock Door	RCS	SERAGENT ELECTRIC PANIC	1		
	Green Line Hallway	RCS	BAR			
	Green Line Hallway	RCS	DEADBOLT WITH BEST	6		
	Green Line Hallway	RCS	CYLINDER			
	All Wrap Arounds	RCS	THROUGHTOUT SCHOOL	?		
	All Best Locksets	RCS	THROUGHTOUT SCHOOL	?	9K LOCKSETS	
	Corbin Russwin panic bars, handles; cores, electric strikes & card readers	RCS	INTERNATIONAL PORTABLE			
	Main Fire Panel	WAVES	Storage Room Behind Stage	1	EST IO500	
	Fire Alarm Voice Evacuation Amplifier	WAVES	Storage Room Behind Stage	1	ANS50	
	Fire Alarm NAC Boosters	WAVES	Throughout the Building	ALL	EST BPS 6	
	Fire Alarm Smoke Detectors	WAVES	Throughout the Building	ALL	PS-1	
	Fire Alarm - CR Relays	WAVES	Throughout the Building	ALL	SIGA CT-1, CT-2,	
	Fire Alarm - Ceiling Mounted Speaker Strobes	WAVES	Throughout the Building	12		
	Fire Alarm - Duct Detectors	WAVES	Throughout the Building	ALL	Super Ducts	
	Fire Alarm - LCD Annunciator Panel	WAVES	Main Entrance	1		
	Fire Alarm - Graphic Display Driver Boards	WAVES	Main Entrance	ALL		
	Fire Alarm - Remote Microphone	WAVES	Main Entrance	1		
	Alarm Dialer	WAVES	Boiler Room	1	411UDAC Dialer	
	Intrusion/Security System - Main Panel	WAVES	Meeting Room by Staff Lounge	1	Ademco 128BP	

DEPARTMENT	ITEM DESCRIPTION	LOCATION		QUANTITY	MODEL NUMBER (IF APPLICABLE)	NOTES
		BUILDING	AREA			
	Intrusion/Security System - Key Pad	WAVES	Main Entrance	ALL		
	Intrusion/Security System - Motion Sensors	WAVES	Throughout the Building	ALL	Honeywell DT7500SN	
	Card Access System - Control Panel	WAVES	MDF Room			
	Card Access System - Control Boards	WAVES	MDF Room	ALL		
	Card Access System - Card Swipe/Readers	WAVES	Throughout the Building	7		
	PA System - Main Building System	WAVES	Main Office Suite	ALL	Telecor	
	iPhone System - To Include Door Camera and Monitors	WAVES	Main Office Suite	ALL	LEM-1D1C	
	Horn Speaker	WAVES	Stage	1		
	Wall Speaker	WAVES	Portable 7	1		
	Projector	WAVES	Room C-5	1	Epson	Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Room C-5	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Room B-9	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Media Center	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Portable 7	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Portable 9	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	WAVES	Portable 12	1		Unsure if this item is on some other salvage list from other Departments
	Motorized Projection Screen	WAVES	Cafeteria/Stage	1		
	Motorized Projection Screen - Control Switch	WAVES	Cafeteria/Stage	1	Da-Lite Screen with Control Switch	
	MCC and Feeder Panel	WAVES	Boiler Room	ALL	Square D	
	Electrical Breakers - Breaker 10	WAVES	Boiler Room	1	Square D	
	Electrical Breakers - Breaker 12	WAVES	Boiler Room	1	Square D	
	Light Fixture - LENSES ONLY	WAVES	Front Entrance Canopy	ALL		
	Area Lighting - LED Light Fixtures	WAVES	Playground Area	ALL		
	Hot Water Heater	WAVES	Boiler Room	1	PVI Series 500	
	Domestic Hot Water Mixing Valve	WAVES	Boiler Room	1	Lawler	
	3" Dual Check Valve	WAVES	Boiler Room	1	Zurn	Serving the Fire Sprinkler System
	Domestic Water 3" Pressure Reducing Valve	WAVES	Boiler Room	1	Zurn	
	dual fuel burner	WAVES	boiler room	1	B2-1	power flame
	boiler controls	WAVES	boiler room	2		fire eye
	fuel oil booster pump	WAVES	boiler room	2		
	domestic hot water pumps	WAVES	boiler room	2	B&G	

DEPARTMENT	ITEM DESCRIPTION	LOCATION		QUANTITY	MODEL NUMBER (IF APPLICABLE)	NOTES
		BUILDING	AREA			
	hot water mix valve	WAVES	boiler room	1	Leonard	
	chilled water pump	WAVES	boiler room	1	P4.4	
	1600 circulators	WAVES	thru out	10	taco	
	Security Video Camera's and Hardware	WAVES	ALL Areas	ALL		Brian, I added this in case the Security Office hasn't requested to salvage this equipment
	Fire Alarm - Main Panel	RCS	Office Suite Closet	1	Edwards EST2	
	Fire Alarm - NAC Boosters	RCS	Office Suite Closet	4	EST BPS 6	
	Fire Alarm - Smoke Detectors	RCS	Throughout the Building	ALL	PS-1	
	Fire Alarm - Monitoring Modules	RCS	Throughout the Building	ALL	EST	
	Fire Alarm - CR Relays	RCS	Throughout the Building	ALL	EST	
	Fire Alarm - Duct Detectors	RCS	Throughout the Building	ALL		
	Fire Alarm - Pull Stations	RCS	Throughout the Building	ALL		
	Alarm Dialer	RCS	Office Suite Closet	1	411UDAC Dialer	
	Intrusion/Security System - Main Panel	RCS	Office Suite Closet	1	Ademco 128BP	
	Intrusion/Security System - Key Pad	RCS	Main Entrance	1		
	Intrusion/Security System - Motion Sensors	RCS	Throughout the Building	ALL	Honeywell DT7500SN	
	Card Access System - Control Panel	RCS	MDF Room			
	Card Access System - Control Boards	RCS	MDF Room	ALL		
	Card Access System - Card Swipe/Readers	RCS	Throughout the Building	12		
	Von Duprin Retractable Panic Bar - Power Supply	RCS	Main Entrance, Above Ceiling	1		
	Maglocks	RCS	Time Out/Seclusion Room	ALL		
	Maglock - Switches	RCS	Time Out/Seclusion Room	ALL		
	Maglock - Power Supplies	RCS	Time Out/Seclusion Room	ALL		
	PA System - Main Building System	RCS	Main Office Suite - MDF Room	ALL	Telecor	All components
	Sound System & Speakers	RCS	Gym	ALL		
	Sound System - Ceiling Mounted Speakers	RCS	Gym	4		
	Clocks - Wall Mounted	RCS	Various Locations	8		
	iPhone System - To Include Door Camera and 2 Monitors	RCS	Main Office Suite	ALL	JF-2MED	
	Promethean Board	RCS	Room 13	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	RCS	Room 6	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	RCS	Room 18	1		Unsure if this item is on some other salvage list from other Departments
	Promethean Board	RCS	Room 20	1		Unsure if this item is on some other salvage list from other Departments
	Projector	RCS	Room 13	1	Epson	Unsure if this item is on some other salvage list from other Departments
	Projector	RCS	Room 6	1	Epson	Unsure if this item is on some other salvage list from other Departments
	Motorized Projection Screen	RCS	Stage/Gym	1		

DEPARTMENT	ITEM DESCRIPTION	LOCATION		QUANTITY	MODEL NUMBER (IF APPLICABLE)	NOTES
		BUILDING	AREA			
	Motorized Projection Screen - Control Switch	RCS	Stage/Gym	1	Da-Lite Screen with Control Switch	
	Electrical Sub Panel	RCS	Hall Closet next to Gym	1	Square D	
	Electrical Sub Panel Breaker - 100 Amp Single Phase Breaker	RCS	Panel P1	1	Square D	
	Electrical Sub Panel Breaker - 100 Amp Three Phase Breaker	RCS	Panel P2	1	Square D	
	Light Fixture - LENSES ONLY	RCS	Front Entrance Canopy	ALL		
	circulator pump P 4-03	RCS	Boiler room	1	Taco	
	motor P4-2	RCS	Boiler room	1	Taco	
	B2-01 ansd 02 boiler controls	RCS	Boiler room	2	Power flame	
	wall mounted circulator	RCS	Boiler room	2	B&G	
	solar temp gauges	RCS	Boiler room	all		
	air compressor air dryer	RCS	Boiler room	1		
	water treatment pump	RCS	Boiler room	1		
	new exhaust fans	RCS	roof	2		
	Mini split a/c unit	RCS	IDF server room /Roof	1		
	Security Video Camera's and Hardware	RCS	ALL Areas	ALL		Brian, I added this in case the Security Office hasn't requested to salvage this equipment
PLAYGROUNDS	3 in a row panel back playground #1	RCS		1	N/A	
	Animal panel back playground #1	RCS		1	N/A	
	Steering wheel panel playground #1	RCS		1	N/A	
	Baseball 3 in a row panel playground #1	RCS		1	N/A	
	Suspension bridge Playground #1	RCS		1	N/A	
	Entire playground music set in back	RCS		1	N/A	Looking to have entire set moved to another site (most likely Orchard Grove)
	Basketball backboards & rims	WAVES		5	N/A	Just the backboards & rims not the poles
	Two ground play panels Playground #2	WAVES		2	N/A	
	Pipe wall barriers Playground #2	WAVES		2	N/A	

END OF SECTION



SaLUT

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December 4, 2017

Brian Staiger
Construction Management
Frederick County Public Schools
191 South East Street
Frederick, Maryland 21701

Subject: Hazmat Survey-FCPS Bid #16-MISC-3
Rock Creek School
191 Waverley Drive Frederick, MD 21702

Mr. Staiger:

On October 4, 2017, Soil and Land Use Technology, Inc (SaLUT) received a Purchase Order (PO No: FCPS1-0000237436) to perform a hazmat survey at Rock Creek School in Frederick, Maryland. A team consisting of Maryland accredited asbestos and lead inspectors, conducted the survey on October 20 and 21 and a follow up quality control and assurance visit on November 10, 2017.

All spaces referenced in this report correspond to the room numbers identified in the floor plan in Appendix A.

1. Methodology

1.a) Asbestos Sampling

The asbestos survey was divided into two distinct phases: pre-inspection planning and inspection for ACM.

Pre-inspection planning consisted of a review of the history (both construction and utilization) of the manholes, planning an inspection strategy, and scheduling inspection work. It was determined that this survey should include all portions of the building likely to be impacted by planned renovations to ensure that intended renovations could be conducted in a safe manner compliant with all applicable Federal and Maryland laws.

Materials that were considered suspect were identified and the number of samples to be collected of these suspect materials was determined by the inspector using AHERA protocols. As defined by AHERA policy, suspect materials include the following building material types:

- ☐ Surfacing materials including spray applied or troweled on wall/ceiling coatings
- ☐ Thermal System Insulation (TSI) including pipe insulation, mudded pipe fittings, boiler lagging, tank insulation, and duct insulation
- ☐ Miscellaneous materials including ceiling tiles, floor tiles/mastic, gaskets (if accessible), fire doors, wallboard/spackle

Suspect materials that were homogeneous in nature (i.e., uniform in color and texture) were identified, touched to determine friability, and sampled by removing a small piece. This small sample was placed into a labeled container. One or more samples were collected from each homogeneous material. Samples were collected in a randomly distributed manner in accordance with AHERA provisions (40 CFR 763.86). The location, condition, and quantity of each homogeneous material were recorded in the inspector's log and sample locations were marked on maps of the property.

Extreme care was taken to avoid fiber liberation during the inspection/sampling process. Before sample collection, a fine mist of water was typically applied to the sample site. Samples were collected using sharpened core samplers and/or razor knives, where necessary, and immediately placed in labeled containers and sealed. Any dust generated was wet wiped and/or high efficiency particulate air (HEPA) vacuumed.

The team collected 101 bulk samples from 33 homogeneous materials. The number of samples collected complies with the minimum number of samples per material classification as specified under AHERA sampling protocols. AHERA specifies that surfacing materials (e.g., concrete) require three samples for materials with less than 1,000 square feet, five samples for materials present in quantities ranging from 1,000 to 5,000 square feet, and seven samples for materials covering greater than 5,000 square feet. Three samples must be collected from all Thermal System Insulation (TSI) in excess of six linear or six square feet. The number of samples collected from miscellaneous materials is left to the discretion of the inspector. The collected samples were submitted to EMSL Analytical in Beltsville, MD. Asbestos samples were analyzed by PLM analysis using EPA Method 600/M4-82-020.

In addition to sampling, existing FCPS documentation for Rock Creek School related to asbestos data were reviewed.

1.b) Lead Sampling

Lead sampling protocols typically used for full lead-based paint inspections are based on the United States Department of Housing and Urban Development (HUD) guidelines and COMAR Title 26 Subtitle 16 for sampling within residential and child occupied structures. The lead-based paint inspection involved two phases; pre-inspection planning and lead-based paint inspection. Additionally, we have included an evaluation of the condition of the materials in the building and guidance regarding proper removal of lead-based paint.



Pre-inspection planning consisted of a review of the history (both construction and utilization) of the building, planning an inspection strategy, and scheduling inspection work. It was determined that this survey should include both interior and exterior portions of the building to ensure that intended renovations could be conducted in a safe manner compliant with all applicable Federal and Maryland laws.

The testing for lead content in paints was performed using an X-Ray Fluorescence (XRF) Spectrum Analyzer (Serial Number 18594). The XRF detects lead in the field by reading fluorescence emanating from a painted surface when exposed to small amounts of radiation. XRF readings are in milligrams per square centimeter (mg/cm²), a mass per area unit. Painted surfaces with a lead concentration of equal or greater than 0.7mg/cm² were considered to be lead-based.

XRF analysis of painted surfaces within the building indicates that lead-based paint is prevalent throughout the building. At least one representative room or room equivalent was inspected on each distinct surface.

During the XRF survey, the four sides of the building were denoted by the letters A, B, C, and D. Side A is the building street address side. Sides B, C, and D are identified clockwise from Side A as one faces the building.

SaLUT tested a total of 205 surfaces that were likely to have lead-based paint. These areas were intended to identify materials likely to have elevated lead levels that would require removal prior to renovation or demolition.

1.c) Polychlorinated Biphenyl (PCB) Equipment

A visual inspection of representative fluorescent lighting fixtures and electrical equipment within the building was conducted to identify Polychlorinated Biphenyl (PCB) markings. A representative number of the light ballasts and electrical equipment were visually assessed for markings indicating that they do not contain PCBs. Ballasts and/or equipment manufactured subsequent to 1979 were required to be labeled as not containing PCBs. Therefore, ballasts and/or equipment observed labeled “No PCBs” are considered to not contain PCBs. If the “No PCBs” label was not observed, the ballasts are assumed to contain PCBs. Evidence of leaking was also noted as part of the survey.

1.d) Mercury and other Chemicals

SaLUT conducted a visual survey for mercury-containing sources and other chemicals which are regulated under EPA’s Resource Conservation and Recovery Act (RCRA) program within the building. A representative number of fluorescent light tubes and all thermometers and gauges were observed for the potential presence of mercury. An inventory of all chemicals in the Boiler Room and Mechanical Custodial Room were also collected.

2. Findings

2. a) Asbestos-containing materials (ACM)

Laboratory analysis of the asbestos bulk samples indicates seven (7) of the 33 sampled homogeneous sampling areas contain asbestos. Another total of 15 homogeneous material were identified to be ACM by reviewing existing records. Table 1 lists the confirmed ACMs, along with the homogeneous materials that were determined to contain asbestos. The table includes the location of the samples, sample and homogeneous numbers and material description of the asbestos positive samples. A complete listing of sampled materials are shown in the lab results in Appendix B. Table 2 summarizes the total quantities for each homogeneous ACM. A room-by-room inventory of these quantities are given in Appendix C.

Table 1: Summary of positive asbestos bulk sample results

Floor	Room	Sample ID	Homog. Area ID	Material	Category	Material Color	Material Description
1	Hallway #6	Rock Creek-2010-7	Rock Creek-7	Caulking, Door	Miscellaneous	Beige	Smooth
1	17	Rock Creek-2010-8	Rock Creek-8	Sealant, Sink	Miscellaneous	Black	Sink insulation
1	11	Rock Creek-2010-9	Rock Creek-9	Caulking, Window	Miscellaneous	Beige	Smooth
1	78	Rock Creek-2010-10	Rock Creek-10	Caulking, Window	Miscellaneous	Gray	Rough
1	Exterior 81	Rock Creek-2010-18	Rock Creek-18	Window Glazing	Miscellaneous	White	Exterior
1	Mechanical (Hallway #1)	Rock Creek-2010-19	Rock Creek-19	Duct Insulation	TSI	White	Cementitious
1	Main Lobby	Rock Creek-2110-34	Rock Creek-34	Window Glazing	Miscellaneous	White	Hard
1	Boiler Room	080702-RCS-11	DWJC	Drywall w/ Joint Compound	Surfacing	White	Drywall w/ Joint Compound
1	Hallway #1	071111-RCS-15	FT02	12" x 12" White and Tan Floor Tile w/ Brown Streaks and White Specks with Mastic	Miscellaneous	White	12" x 12" White and Tan Floor Tile w/ Brown Streaks and White Specks with Mastic
1	Home Economics	070202-RCS-03	FT14	White and Grey Cubed Pattern	Miscellaneous	White	White and Grey Cubed Pattern
1	Main Lobby	071111-RCS-25	M01	Black Pipe Wrap on Pipe	Miscellaneous	Black	Black Pipe Wrap on Pipe
1	General Office	092500-RCS-03	M03	Black Mastic on Fiberglass Insulate	Miscellaneous	Black	Black Mastic on Fiberglass Insulate
1	Hall 1	071111-RCS-27	M05	Black Paper Wrap on Pipe	Miscellaneous	Black	Black Paper Wrap on Pipe
1	Main Lobby	080811-RCS-03	M06	White Endcap Mastic on Fiberglass	Miscellaneous	White	White Endcap Mastic on Fiberglass
1	Main Lobby	071111-RCS-28	M07	White Pipe Wrap on Fiberglass Pipe	Miscellaneous	White	White Pipe Wrap on Fiberglass Pipe
1	Boiler Room	092500-RCS-06	M08	White Seam Mastic on Fiberglass Pipe	Miscellaneous	White	White Seam Mastic on Fiberglass Pipe
1	Mail Room	071111-RCS-31	M11	White Mastic on Foil Wrapped Fiberglass	Miscellaneous	White	White Mastic on Foil Wrapped Fiberglass

Floor	Room	Sample ID	Homog. Area ID	Material	Category	Material Color	Material Description
1	11	071111-RCS-33	M13	White Mastic on Metal Roof Drain Bowl	Miscellaneous	White	White Mastic on Metal Roof Drain Bowl
1	25	071111-RCS-34	M14	White Mastic on Paper	Miscellaneous	White	White Mastic on Paper
1	Home Economics	092500-RCS-09	S1	Smooth 2 Coat Plaster	Surfacing	White	Smooth 2 Coat Plaster
1	Mechanical (Hallway #1)	070202-RCS-14	TSI02	1" - 3" Block Pipe Hanger Insulation	TSI	White	1" - 3" Block Pipe Hanger Insulation
1	Kitchen	070202-RCS-10	TSI04	12" Block Pipe Hanger Insulation	TSI	White	12" Block Pipe Hanger Insulation

Table 2: Summary of homogeneous ACM quantities

Homogeneous Area	Material	Material Color	Quantity	Units
DWJC	Joint Compound	White	6534	SF
FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	22664	SF
M01	Wrap on Pipe	Black	269	LF
M01	Wrap on Pipe	Black	269	LF
M03	Mastic on Fiberglass Insulation	Black	942	LF
M05	Paper Wrap on Pipe	Black	4	LF
M06	Endcap Mastic Wrap on Pipe	White	219	LF
M07	Pipe wrap on Fiberglass Pipe	White	30	LF
M08	Seam Mastic	White	500	LF
M08	Seam Mastic on Fiberglass	White	863	LF
M11	Mastic on Foil Wrap	White	5	LF
M13	Metal Roof Drain Bowl	White	8	LF
M14	Mastic on Paper	White	6	LF
Rock Creek-19	Duct Insulation	White	490	SF
Rock Creek-34	Window Glazing	White	523	SF
Rock Creek-7	Caulking, Door	Beige	2953	LF
Rock Creek-8	Sealant, Sink	Black	104	SF
Rock Creek-9	Caulking, Window	Beige	1180	LF
S1	Smooth 2 Coat Plaster	White	260	SF
TSI01	Mudded Duct Insulation	White	2	EA
TSI04	12" Block Pipe Hanger Insulation	White	6	EA

2.b) Lead Sample Results

Laboratory analysis indicates that **none of** the distinct lead paint readings contain greater than 0.5% lead by weight, the action level for lead paint in Maryland. The suspect LBP surfaces that were tested are listed in Appendix D.

2.c) Polychlorinated Biphenyl (PCB) Equipment Findings

SaLUT observed all inspected light ballasts contained a manufacturer label stating “No PCBs”, hence they may be disposed of as regular waste. However, it is important to note that only a representative number of light ballasts were inspected and if any ballasts are found without a such label or “contains PCB” label they should be disposed of in accordance with the regulations outlined in Volume 40 Code of Federal Regulations (CFR) Part 761.

2.d) Mercury and other Chemicals Findings

SaLUT observed the following list (Table 3) of fluorescent light tubes, thermometers, and mechanical pressure gauges within school as these materials may potentially contain a small amount of mercury. An inventory of all chemicals in the Boiler Room and Mechanical Custodial Room are also listed in Table 3.

Table 3: Inventory of possible mercury-containing material and other chemicals

Location	Equipment Type	Quantity
Possible mercury-containing equipment		
Boiler Room	Thermometers	7 Ea
	Pressure Gauges	14 Ea
	Thermostats	1 Ea
Throughout the school	Fluorescent light bulbs	1626 Ea
Other chemicals		
Boiler Room	Coolant	1 Container
	Synthetic Ester	2 Cans
	Boiler Components with potential oil contamination	Multiple
Mechanical Custodial Room	Paint cans, spray cans, light bulbs	Multiple

3. Recommendations

3.a) Asbestos-containing Material (ACM)

SaLUT recommends the removal of all identified ACM in advance should future demolition activities disturb or impact the identified ACM in anyway. A contractor holding a current Maryland Asbestos Abatement License should perform the abatement of all identified ACM in accordance with all applicable federal, state, and local regulations and standards. Alternatively, all non-friable ACMs (such as floor tiles, mastic, etc.) are classified by the National Emission Standard for Hazardous Air Pollutants (NESHAP) as Category I non-friable ACM. In accordance with NESHAP, as long as such materials remain in a non-friable state and are not subjected to mechanical drilling, sanding, grinding, or sawing during demolition activities, they may remain in place during demolition, provided no visible emissions are generated during the demolition process. However, if these materials remain in place during demolition, all demolition debris must be disposed of in a landfill that will accept debris containing Category I non-friable asbestos-containing materials. Approval from local regulatory agencies is required if ACM is to remain in place during demolition activities. In this case the Maryland Department of the Environment

(MDE) must be contacted to provide a “Determination of Applicability” if the Contractor elects to demolish the building with the identified ACM in place.

3.b) Lead-based Paint

There are no recommendations at this point.

3.c) Polychlorinated Biphenyl (PCB)

There are no recommendations at this point.

3.d) Mercury-containing equipment and other chemicals

All Mercury-containing building materials/wastes and other chemicals within the building should be handled by appropriately trained/licensed personnel and disposed of in accordance with applicable rules and regulations.

4. Survey Limitation and Disclaimer

Information in this inspection report relating to asbestos and lead, although believed to be inclusive and accurate, was based on visual observations and field sampling of accessible areas. Limiting conditions included limited destructive sampling and inaccessible areas such as between walls and floors of the structures, and limited subsurface assessment of the property. Reasonable efforts are made to extrapolate where possible such as where insulated pipe runs into and through a wall. SaLUT, Inc. reserves the right to revise any recommendations and conclusions, and does not guarantee or accept any liability that encompasses this survey of all hazardous or regulated materials located within this building.

SaLUT appreciates the opportunity to provide these services to FCPS. If you have any questions regarding these results, please feel free to contact me at (301) 595-3783.

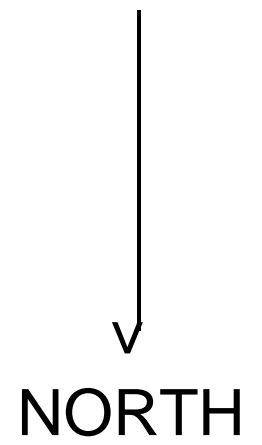
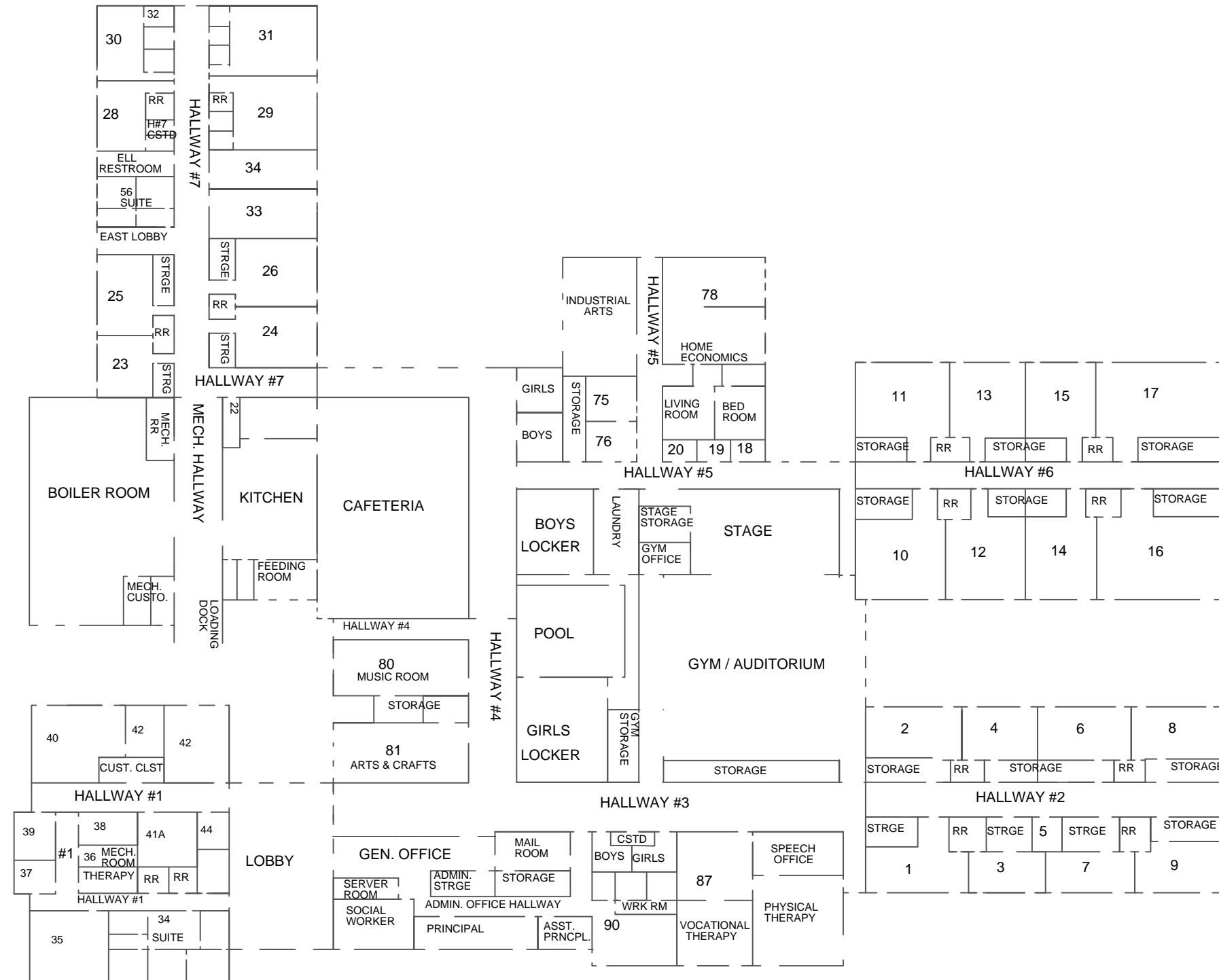
Best regards,



Dilan Mack
Project Manager
Soil and Land Use Technology, Inc. (SaLUT)

Appendix A- Floor Plan





Soil and Land Use Technology, Inc.
1818 New York Ave, Suite 231, NE
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Rock Creek School
191 Waverley Drive, Frederick MD 21702

Appendix B- ACM Lab Results and Chain-of-Custodies



EMSL Analytical, Inc.

10768 Baltimore Avenue Beltsville, MD 20705

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<http://www.EMSL.com/beltsvillelab@emsl.com>

EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Attention: Dilan Mack

SalUT

1818 New York Avenue, NE

Suite 218A

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Phone: (202) 832-1433

Fax: (301) 595-3787

Received Date: 10/24/2017 2:00 PM

Analysis Date: 10/25/2017 - 10/30/2017

Collected Date: 10/21/2017

Project: FCPS - ROCK CREEK SCHOOL (17-091) - 191 WAVERLY DRIVE, FREDERICK, MD 21702

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos % Type
			% Fibrous	% Non-Fibrous	
ROCK CREEK 2010-10A	CAULKING, WINDOW - RM 78	Gray Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
191712953-0001					
ROCK CREEK 2010-10B	CAULKING, WINDOW - RM 78				Positive Stop (Not Analyzed)
191712953-0002					
ROCK CREEK 2010-10C	CAULKING, WINDOW - RM 78				Positive Stop (Not Analyzed)
191712953-0003					
ROCK CREEK 2010-11A-Floor Tile	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Tan Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
191712953-0004					
ROCK CREEK 2010-11A-Mastic	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
191712953-0004A					
ROCK CREEK 2010-11B-Floor Tile	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Tan Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
191712953-0005					
ROCK CREEK 2010-11B-Mastic	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
191712953-0005A					
ROCK CREEK 2010-11C-Floor Tile	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Tan Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0006					
ROCK CREEK 2010-11C-Mastic	FTS - PEACH, BRN, & WHITE SPECKS - RM 56	Yellow Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
191712953-0006A					
ROCK CREEK 2010-12A	CARPET GLUE - UNDER CARPET - RM 27	Yellow Fibrous Homogeneous	3% Synthetic	97% Non-fibrous (Other)	None Detected
191712953-0007					
ROCK CREEK 2010-12B	CARPET GLUE - UNDER CARPET - RM 27	Yellow Non-Fibrous Homogeneous	3% Synthetic	97% Non-fibrous (Other)	None Detected
191712953-0008					
ROCK CREEK 2010-12C	CARPET GLUE - UNDER CARPET - RM 27	Yellow Non-Fibrous Homogeneous	3% Synthetic	97% Non-fibrous (Other)	None Detected
191712953-0009					

Initial report from: 10/30/2017 15:05:36



EMSL Analytical, Inc.

10768 Baltimore Avenue Beltsville, MD 20705

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<http://www.EMSL.com/beltsvillelab@emsl.com>

EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-13A 191712953-0010	PAPER WRAP - WRAP AROUND FG - BOILER	White Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-13B 191712953-0011	PAPER WRAP - WRAP AROUND FG - BOILER	White Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-13C 191712953-0012	PAPER WRAP - WRAP AROUND FG - BOILER	White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-14A 191712953-0013	WALL PANEL - LARGE PEG BOARD HOLES - RM 80	Brown/White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-14B 191712953-0014	WALL PANEL - LARGE PEG BOARD HOLES - RM 80	Brown/White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-14C 191712953-0015	WALL PANEL - LARGE PEG BOARD HOLES - RM 80	Brown/White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-15A 191712953-0016	GYPSUM BOARD - PARTITION WALL - RM 81	Brown/White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-15B 191712953-0017	GYPSUM BOARD - PARTITION WALL - RM 81	Brown/White Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-15C 191712953-0018	GYPSUM BOARD - PARTITION WALL - RM 81	Brown/White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-16A 191712953-0019	GYPSUM BOARD - PARTITION WALL - RM 81	Gray Fibrous Homogeneous	5% Cellulose	75% Gypsum 20% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-16B 191712953-0020	GYPSUM BOARD - PARTITION WALL - RM 81	Gray Fibrous Homogeneous	5% Cellulose	70% Gypsum 25% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-16C 191712953-0021	GYPSUM BOARD - PARTITION WALL - RM 81	Gray Fibrous Homogeneous	8% Cellulose	75% Gypsum 17% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-17A 191712953-0022	CAULKING. WINDOW - EXT - EXT 81	Brown Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-17B 191712953-0023	CAULKING. WINDOW - EXT - EXT 81	Brown Non-Fibrous Homogeneous	3% Synthetic	97% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-17C 191712953-0024	CAULKING. WINDOW - EXT - EXT 81	Brown Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected

Initial report from: 10/30/2017 15:05:36



EMSL Analytical, Inc.

10768 Baltimore Avenue Beltsville, MD 20705

Tel/Fax: (301) 937-5700 / (301) 937-5701

<http://www.EMSL.com/beltsvillelab@emsl.com>

EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-18A	GLAZING. WINDOW - EXT - EXT 81	Gray Fibrous Homogeneous		10% Ca Carbonate 85% Non-fibrous (Other)	5% Chrysotile
191712953-0025					
ROCK CREEK 2010-18B	GLAZING. WINDOW - EXT - EXT 81				Positive Stop (Not Analyzed)
191712953-0026					
ROCK CREEK 2010-18C	GLAZING. WINDOW - EXT - EXT 81				Positive Stop (Not Analyzed)
191712953-0027					
ROCK CREEK 2010-19A	DUCT INS - CEMENTITIOUS - MECH NEXT TO 38	Gray Fibrous Homogeneous		70% Non-fibrous (Other)	30% Chrysotile
191712953-0028					
ROCK CREEK 2010-19B	DUCT INS - CEMENTITIOUS - MECH NEXT TO 38				Positive Stop (Not Analyzed)
191712953-0029					
ROCK CREEK 2010-19C	DUCT INS - CEMENTITIOUS - MECH NEXT TO 38				Positive Stop (Not Analyzed)
191712953-0030					
ROCK CREEK 2010-2A-Floor Tile	FTS - BRN & GRN SPECKS - RM 1	White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0031					
ROCK CREEK 2010-2A-Mastic	FTS - BRN & GRN SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
191712953-0031A					
ROCK CREEK 2010-2B-Floor Tile	FTS - BRN & GRN SPECKS - RM 1	White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0032					
ROCK CREEK 2010-2B-Mastic	FTS - BRN & GRN SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
191712953-0032A					
ROCK CREEK 2010-2C-Floor Tile	FTS - BRN & GRN SPECKS - RM 1	White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0033					
ROCK CREEK 2010-2C-Mastic	FTS - BRN & GRN SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
191712953-0033A					
ROCK CREEK 2010-20A	VIBRATION DAMPING CLOTH - MECH NEXT TO 38	Black Fibrous Homogeneous	45% Glass	55% Non-fibrous (Other)	None Detected
191712953-0034					
ROCK CREEK 2010-20B	VIBRATION DAMPING CLOTH - MECH NEXT TO 38	Black Fibrous Homogeneous	45% Glass	55% Non-fibrous (Other)	None Detected
191712953-0035					

Initial report from: 10/30/2017 15:05:36



EMSL Analytical, Inc.

10768 Baltimore Avenue Beltsville, MD 20705

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<http://www.EMSL.com/beltsvillelab@emsl.com>

EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-20C	VIBRATION DAMPING CLOTH - MECH NEXT TO 38	Black Fibrous Homogeneous	45% Glass	55% Non-fibrous (Other)	None Detected
191712953-0036					
ROCK CREEK 2010-21A	FTS - LT BLUE SPECKS - RM 5	White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
191712953-0037 Floor Tile only.					
ROCK CREEK 2010-21B	FTS - LT BLUE SPECKS - RM 5	White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
191712953-0038 Floor Tile only.					
ROCK CREEK 2010-21C	FTS - LT BLUE SPECKS - RM 5	White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
191712953-0039 Floor Tile only.					
ROCK CREEK 2010-22A-Floor Tile	FTS - GRAY SPECKS - RM 4	Gray/White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0040					
ROCK CREEK 2010-22A-Mastic	FTS - GRAY SPECKS - RM 4	Tan/White Non-Fibrous Homogeneous	2% Cellulose 3% Synthetic	95% Non-fibrous (Other)	None Detected
191712953-0040A					
ROCK CREEK 2010-22B-Floor Tile	FTS - GRAY SPECKS - RM 4	Gray/White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0041					
ROCK CREEK 2010-22B-Mastic	FTS - GRAY SPECKS - RM 4	Tan/White Non-Fibrous Homogeneous	3% Cellulose 2% Synthetic	95% Non-fibrous (Other)	None Detected
191712953-0041A					
ROCK CREEK 2010-22C-Floor Tile	FTS - GRAY SPECKS - RM 4	Gray/White Non-Fibrous Homogeneous		55% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0042					
ROCK CREEK 2010-22C-Mastic	FTS - GRAY SPECKS - RM 4	Tan/White Non-Fibrous Homogeneous	3% Cellulose 2% Synthetic	95% Non-fibrous (Other)	None Detected
191712953-0042A					
ROCK CREEK 2010-23A	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 4	Gray/Yellow Non-Fibrous Homogeneous	5% Cellulose 3% Synthetic	92% Non-fibrous (Other)	None Detected
191712953-0043					
ROCK CREEK 2010-23B	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 4	Gray/Yellow Non-Fibrous Homogeneous	2% Cellulose 5% Synthetic	93% Non-fibrous (Other)	None Detected
191712953-0044					
ROCK CREEK 2010-23C	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 4	Gray/Tan/Yellow Non-Fibrous Homogeneous	5% Cellulose 5% Synthetic	90% Non-fibrous (Other)	None Detected
191712953-0045					
ROCK CREEK 2010-3A	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
191712953-0046					

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EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-3B 191712953-0047	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-3C 191712953-0048	MSTC, FLR - W/ WHITE 12X12 W/ GRAY SPECKS - RM 1	Yellow Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-4A 191712953-0049	HEATER INS - SIDE PANELS - RM 1	Brown Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-4B 191712953-0050	HEATER INS - SIDE PANELS - RM 1	Brown Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-4C 191712953-0051	HEATER INS - SIDE PANELS - RM 1	Brown Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-5A 191712953-0052	MSTC, BASEBOARD - RM 1	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-5B 191712953-0053	MSTC, BASEBOARD - RM 1	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-5C 191712953-0054	MSTC, BASEBOARD - RM 1	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-6A 191712953-0055	CAULKING, DOOR - GYM	Brown Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-6B 191712953-0056	CAULKING, DOOR - GYM	Brown Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-6C 191712953-0057	CAULKING, DOOR - GYM	Brown Non-Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-7A 191712953-0058	CAULKING, DOOR - HALLWAY EXIT DOOR NEXT TO 17	Gray/White/Red Fibrous Heterogeneous		5% Quartz 45% Ca Carbonate 43% Non-fibrous (Other)	7% Chrysotile
ROCK CREEK 2010-7B 191712953-0059	CAULKING, DOOR - HALLWAY EXIT DOOR NEXT TO 17				Positive Stop (Not Analyzed)
ROCK CREEK 2010-7C 191712953-0060	CAULKING, DOOR - HALLWAY EXIT DOOR NEXT TO 17				Positive Stop (Not Analyzed)
ROCK CREEK 2010-8A 191712953-0061	SEALANT, SINK - SINK INS - RM 17	Brown/Black Non-Fibrous Homogeneous		45% Ca Carbonate 52% Non-fibrous (Other)	3% Chrysotile
ROCK CREEK 2010-8B 191712953-0062	SEALANT, SINK - SINK INS - RM 17				Positive Stop (Not Analyzed)
ROCK CREEK 2010-8C 191712953-0063	SEALANT, SINK - SINK INS - RM 17				Positive Stop (Not Analyzed)
ROCK CREEK 2010-9A 191712953-0064	CAULKING, WINDOW - RM 11	Gray/Various Non-Fibrous Heterogeneous		40% Ca Carbonate 57% Non-fibrous (Other)	3% Chrysotile

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EMSL Order: 191712953

Customer ID: SALU50

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Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-9B	CAULKING, WINDOW - RM 11				Positive Stop (Not Analyzed)
191712953-0065					
ROCK CREEK 2010-9C	CAULKING, WINDOW - RM 11				Positive Stop (Not Analyzed)
191712953-0066					
ROCK CREEK 2010-24A	FTS - BRN & PEACH SPECKS - RM 8	Brown/Various Non-Fibrous Homogeneous		45% Ca Carbonate 55% Non-fibrous (Other)	None Detected
191712953-0067					
ROCK CREEK 2010-24B	FTS - BRN & PEACH SPECKS - RM 8	Brown/Various Non-Fibrous Homogeneous		45% Ca Carbonate 55% Non-fibrous (Other)	None Detected
191712953-0068					
ROCK CREEK 2010-24C	FTS - BRN & PEACH SPECKS - RM 8	Brown/Various Non-Fibrous Homogeneous		45% Ca Carbonate 55% Non-fibrous (Other)	None Detected
191712953-0069					
ROCK CREEK 2010-25A	MSTC, FL - RM 8	Gray/Yellow Non-Fibrous Heterogeneous	10% Cellulose	35% Ca Carbonate 55% Non-fibrous (Other)	None Detected
191712953-0070					
ROCK CREEK 2010-25B	MSTC, FL - RM 8	Gray/Yellow Non-Fibrous Heterogeneous	7% Cellulose	5% Quartz 40% Ca Carbonate 48% Non-fibrous (Other)	None Detected
191712953-0071					
ROCK CREEK 2010-25C	MSTC, FL - RM 8	Gray/Yellow Non-Fibrous Heterogeneous	10% Cellulose	5% Quartz 40% Ca Carbonate 45% Non-fibrous (Other)	None Detected
191712953-0072					
ROCK CREEK 2010-26A	TILE GROUT - BOYS' LOCKER	Gray Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
191712953-0073					
ROCK CREEK 2010-26B	TILE GROUT - BOYS' LOCKER	Gray Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
191712953-0074					
ROCK CREEK 2010-26C	TILE GROUT - BOYS' LOCKER	Gray Non-Fibrous Homogeneous		25% Quartz 75% Non-fibrous (Other)	None Detected
191712953-0075					
ROCK CREEK 2010-27A	MSTC, BASEBOARD - HALLWAY NEXT TO 82 STAGE	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
191712953-0076					
ROCK CREEK 2010-27B	MSTC, BASEBOARD - HALLWAY NEXT TO 82 STAGE	Brown Non-Fibrous Homogeneous	3% Fibrous (Other)	97% Non-fibrous (Other)	None Detected
191712953-0077					
ROCK CREEK 2010-27C	MSTC, BASEBOARD - HALLWAY NEXT TO 82 STAGE	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
191712953-0078					
ROCK CREEK 2010-28A	MSTC, BASEBOARD - ASSOC W/ BLK BB - HALLWAY NEXT TO 80	Brown Non-Fibrous Homogeneous	6% Fibrous (Other)	94% Non-fibrous (Other)	None Detected
191712953-0079					

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EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-28B 191712953-0080	MSTC, BASEBOARD - ASSOC W/ BLK BB - HALLWAY NEXT TO 80	Brown Non-Fibrous Homogeneous	8% Fibrous (Other)	92% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-28C 191712953-0081	MSTC, BASEBOARD - ASSOC W/ BLK BB - HALLWAY NEXT TO 80	Brown Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-29A 191712953-0082	TAR PAPER - UNDER SHINGLES - ROOF	Brown/Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-29B 191712953-0083	TAR PAPER - UNDER SHINGLES - ROOF	Brown/Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-29C 191712953-0084	TAR PAPER - UNDER SHINGLES - ROOF	Brown/Black Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-30A 191712953-0085	ROOF FLASHING - UNDER METAL EDGES - ROOF	White/Black Fibrous Homogeneous	45% Synthetic	55% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-30B 191712953-0086	ROOF FLASHING - UNDER METAL EDGES - ROOF	Gray/White/Black Fibrous Homogeneous	30% Synthetic	70% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-30C 191712953-0087	ROOF FLASHING - UNDER METAL EDGES - ROOF	White/Black Fibrous Homogeneous	35% Synthetic	65% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-31A 191712953-0088	ROOF SHINGLES - GRN & RED SPECKS - ROOF	Black Fibrous Homogeneous	25% Glass	15% Quartz 60% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-31B 191712953-0089	ROOF SHINGLES - GRN & RED SPECKS - ROOF	Black Fibrous Homogeneous	25% Glass	15% Quartz 60% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-31C 191712953-0090	ROOF SHINGLES - GRN & RED SPECKS - ROOF	Black Fibrous Homogeneous	30% Glass	15% Quartz 55% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-32A 191712953-0091	ROOF FLASHING - TAR SEALANT ASSOC W/ FLASHING - ROOF	White/Black/Silver Fibrous Heterogeneous	25% Cellulose 15% Glass	5% Quartz 35% Ca Carbonate 20% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-32B 191712953-0092	ROOF FLASHING - TAR SEALANT ASSOC W/ FLASHING - ROOF	White/Black/Silver Fibrous Heterogeneous	30% Cellulose 5% Glass	5% Quartz 35% Ca Carbonate 25% Non-fibrous (Other)	None Detected
ROCK CREEK 2010-32C 191712953-0093	ROOF FLASHING - TAR SEALANT ASSOC W/ FLASHING - ROOF	White/Black/Silver Fibrous Heterogeneous	25% Cellulose 5% Glass	5% Quartz 35% Ca Carbonate 30% Non-fibrous (Other)	None Detected



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EMSL Order: 191712953

Customer ID: SALU50

Customer PO:

Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Non-Asbestos					Asbestos
Sample	Description	Appearance	% Fibrous	% Non-Fibrous	% Type
ROCK CREEK 2010-33A	ROOF CORE - GYM ROOF ASSOC W/ ALL ROOFS - ROOF	Gray/Black Fibrous Heterogeneous	15% Cellulose 10% Synthetic	75% Non-fibrous (Other)	None Detected
191712953-0094					
ROCK CREEK 2010-33B	ROOF CORE - GYM ROOF ASSOC W/ ALL ROOFS - ROOF	Gray/Black Fibrous Heterogeneous	10% Cellulose 25% Synthetic	65% Non-fibrous (Other)	None Detected
191712953-0095					
ROCK CREEK 2010-33C	ROOF CORE - GYM ROOF ASSOC W/ ALL ROOFS - ROOF	Gray/Black Fibrous Homogeneous	10% Cellulose 35% Synthetic	55% Non-fibrous (Other)	None Detected
191712953-0096					
ROCK CREEK 2010-33D	ROOF CORE - GYM ROOF ASSOC W/ ALL ROOFS - ROOF	Brown/Black Fibrous Homogeneous	15% Cellulose 35% Synthetic	50% Non-fibrous (Other)	None Detected
191712953-0097					
ROCK CREEK 2010-33E	ROOF CORE - GYM ROOF ASSOC W/ ALL ROOFS - ROOF	Black Fibrous Homogeneous	10% Cellulose 40% Synthetic	50% Non-fibrous (Other)	None Detected
191712953-0098					
ROCK CREEK 2010-34A	WINDOW GLAZING - LOBBY	Gray/Tan/White Non-Fibrous Homogeneous		45% Ca Carbonate 50% Non-fibrous (Other)	5% Chrysotile
191712953-0099					
ROCK CREEK 2010-34B	WINDOW GLAZING - LOBBY				Positive Stop (Not Analyzed)
191712953-0100					
ROCK CREEK 2010-34C	WINDOW GLAZING - LOBBY				Positive Stop (Not Analyzed)
191712953-0101					

Analyst(s)

Luba Stockert (83)

William Chrobak (13)

Joe Centifonti, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Beltsville, MD NVLAP Lab Code 200293-0

Initial report from: 10/30/2017 15:05:36



Asbestos Chain of Custody

EMSL Order Number (Lab Use Only)

191712953

 PHONE:
FAX:

Company Name: SalUT, Inc.		EMSL Customer ID:	
Street: 1818 New York Avenue NE, Suite 231		City: Washington	State/Province: DC
Zip/Postal Code: 20002	Country: USA	Telephone #: 240-643-3129	Fax #:
Report To (Name): Dilan Mack		Please Provide Results: <input type="checkbox"/> Fax <input checked="" type="checkbox"/> Email	
Email Address: dmack@salutinc.com		Purchase Order:	
Project Number/Location: FCPS-Rock Creek School (17-091)		EMSL Project ID (Internal Use Only):	
Location Address: 191 Waverly Drive, Fredenck MD 21702		CT Samples: <input type="checkbox"/> Commercial/Taxable <input type="checkbox"/> Residential/Tax Exempt	
EMSL-Bill to: <input checked="" type="checkbox"/> Same <input type="checkbox"/> Different - If Bill to is Different note instructions in Comments** Third Party Billing requires written authorization from third party			
Turnaround Time (TAT) Options* - Please Check			
<input type="checkbox"/> 3 Hour	<input type="checkbox"/> 6 Hour	<input type="checkbox"/> 24 Hour	<input type="checkbox"/> 48 Hour <input type="checkbox"/> 72 Hour <input type="checkbox"/> 96 Hour <input checked="" type="checkbox"/> 1 Week <input type="checkbox"/> 2 Week
*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.			
PCM - Air <input type="checkbox"/> Check if samples are from NY <input type="checkbox"/> NIOSH 7400 <input type="checkbox"/> w/ OSHA 8hr. TWA PLM - Bulk (reporting limit) <input checked="" type="checkbox"/> PLM EPA 600/R-93/116 (<1%) <input type="checkbox"/> PLM EPA NOB (<1%) Point Count <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) Point Count w/Gravimetric <input type="checkbox"/> 400 (<0.25%) <input type="checkbox"/> 1000 (<0.1%) <input type="checkbox"/> NYS 198.1 (friable in NY) <input type="checkbox"/> NYS 198.6 NOB (non-friable-NY) <input type="checkbox"/> NYS 198.8 SOF-V <input type="checkbox"/> NIOSH 9002 (<1%)	TEM - Air <input type="checkbox"/> 4-4.5hr TAT (AHERA only) <input type="checkbox"/> AHERA 40 CFR, Part 763 <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> EPA Level II <input type="checkbox"/> ISO 10312 TEM - Bulk <input type="checkbox"/> TEM EPA NOB <input type="checkbox"/> NYS NOB 198.4 (non-friable-NY) <input type="checkbox"/> Chatfield SOP <input type="checkbox"/> TEM Mass Analysis-EPA 600 sec. 2.5 TEM - Water: EPA 100.2 Fibers >10µm <input type="checkbox"/> Waste <input type="checkbox"/> Drinking All Fiber Sizes <input type="checkbox"/> Waste <input type="checkbox"/> Drinking	TEM- Dust <input type="checkbox"/> Microvac - ASTM D 5755 <input type="checkbox"/> Wipe - ASTM D6480 <input type="checkbox"/> Carpet Sonication (EPA 600/J-93/167) Soil/Rock/Vermiculite <input type="checkbox"/> PLM EPA 600/R-93/116 with milling prep (<1%) <input type="checkbox"/> PLM EPA 600/R-93/116 with milling prep (<0.25%) <input type="checkbox"/> TEM EPA 600/R-93/116 with milling prep (<0.1%) <input type="checkbox"/> TEM Qualitative via Filtration Prep <input type="checkbox"/> TEM Qualitative via Drop Mount Prep <input type="checkbox"/> Cincinnati Method EPA 600/R-04/004 - PLM/TEM (BC only) Other: <input type="checkbox"/>	
<input checked="" type="checkbox"/> Check For Positive Stop - Clearly Identify Homogenous Group		Filter Pore Size (Air Samples): <input type="checkbox"/> 0.8µm <input type="checkbox"/> 0.45µm	
Samplers Name: W. Hernandez/Kenny Long		Samplers Signature:	
Sample #	Sample Description (Location, Color, Dimension)	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
	See bulk sample data sheet attached.		10/21/17
Client Sample # (s):		Total # of Samples: 101	
Relinquished (Client):		Date:	Time:
Received (Lab): <i>[Signature]</i>		Date: 10/24/17	Time: 2 pm
Comments/Special Instructions:			



Soil and Land Use Technology, Inc.
1818 New York Ave, NE Suite 231,
Washington DC 20002
Tel: (301) 595-3783

Asbestos Sample Chain of Custody

Facility

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Sample ID	Sample Sequence	Material	Material Color	Material Description	Floor	Room	Category	No. of Samples
Rock Creek-2010-10	A,B,C	Caulking, Window	Gray	Rough	1	78	Miscellaneous	3
Rock Creek-2010-11	A,B,C	Floor Tiles (12"x12")	Light Brown	Peach, Brown and White specks	1	56	Miscellaneous	3
Rock Creek-2010-12	A,B,C	Carpet Glue	Yellow	Under carpet	1	27	Miscellaneous	3
Rock Creek-2010-13	A,B,C	Paper Wrap	White	Wrap around fiberglass	1	Boiler	TSI	3
Rock Creek-2010-14	A,B,C	Wall Panel	White	Large peg board holes	1	80	Miscellaneous	3
Rock Creek-2010-15	A,B,C	Gypsum Board	Beige	Partition Wall	1	81	Miscellaneous	3
Rock Creek-2010-16	A,B,C	Gypsum Board	White	Partition Wall	1	81	Miscellaneous	3
Rock Creek-2010-17	A,B,C	Caulking, Window	Gray	Exterior	1	Exterior 81	Miscellaneous	3
Rock Creek-2010-18	A,B,C	Window Glazing	White	Exterior	1	Exterior 81	Miscellaneous	3
Rock Creek-2010-19	A,B,C	Duct Insulation	White	Cementitious	1	Mechanical next to 38	TSI	3
Rock Creek-2010-20	A,B,C	Floor Tiles (12"x12")	White	Brown and Green specks	1	1	Miscellaneous	3
Rock Creek-2010-21	A,B,C	Vibration Damping Cloth	Black	Smooth	1	Mechanical next to 38	Miscellaneous	3
Rock Creek-2010-22	A,B,C	Floor Tiles (12"x12")	White	Light blue specks	1	5	Miscellaneous	3
Rock Creek-2010-23	A,B,C	Mastic, Floor	Brown	Gray specks	1	4	Miscellaneous	3
Rock Creek-2010-3	A,B,C	Mastic, Floor	Yellow	With white 12x12 with gray specks	1	4	Miscellaneous	3
Rock Creek-2010-4	A,B,C	Heater Insulation	Brown	Smooth	1	1	TSI	3
Rock Creek-2010-5	A,B,C	Mastic, Baseboard	Brown	Smooth	1	1	Miscellaneous	3
Rock Creek-2010-6	A,B,C	Caulking, Door	Gray	Smooth	1	Gym	Miscellaneous	3
Rock Creek-2010-7	A,B,C	Caulking, Door	Beige	Smooth	1	Hallway Exit door next to 17	Miscellaneous	3



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Asbestos Sample Chain of Custody

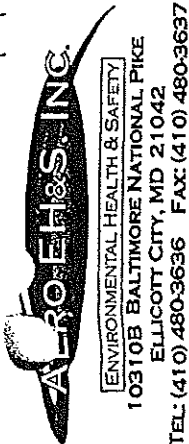
Facility

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Rock Creek-2010-8	A,B,C	Sealant, Sink	Black	Sink insulation	1	17	Miscellaneous	3
Rock Creek-2010-9	A,B,C	Caulking, Window	Beige	Smooth	1	11	Miscellaneous	3
Rock Creek-2110-24	A,B,C	Floor Tiles (12"x12")	Light Brown	Brown and Peach specks	1	8	Miscellaneous	3
Rock Creek-2110-25	A,B,C	Mastic, Floor	Yellow	Rough	1	8	Miscellaneous	3
Rock Creek-2110-26	A,B,C	Tile Grout	Gray	Smooth	1	Boys Locker	Miscellaneous	3
Rock Creek-2110-27	A,B,C	Mastic, Baseboard	Brown	Rough	1	Hallway next to 82 Stage	Miscellaneous	3
Rock Creek-2110-28	A,B,C	Mastic, Baseboard	Brown	Associated with Blk BB	1	Hallway next to 80	Miscellaneous	3
Rock Creek-2110-29	A,B,C	To Paper	Black	Under shingles	Exterior	Roof	Miscellaneous	3
Rock Creek-2110-30	A,B,C	Roof Flashing	White	Under metal edges	Exterior	Roof	Miscellaneous	3
Rock Creek-2110-31	A,B,C	Roof Shingles	Brown	Green and Red specks	Exterior	Roof	Miscellaneous	3
Rock Creek-2110-32	A,B,C	Roof Flashing	Black	Tar sealant associated with flashing	Exterior	Roof	Miscellaneous	3
Rock Creek-2110-33	A,B,C,D,E	Roof Core	Black	Gym roof. Associated with all roofs.	Exterior	Roof	Miscellaneous	5
Rock Creek-2110-34	A,B,C	Window Glazing	White	Hard	1	Lobby	Miscellaneous	3

Please e-mail results to
Kelly@aeroehs.com

BULK ASBESTOS SAMPLE SHEET



Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Project Name: Rock Creek School - AHERA Inspection
Project Location: Frederick, MD
Client/Job Number: 271111

Inspectors: Kelly / Murphy

Date Sampled: 7/11/11

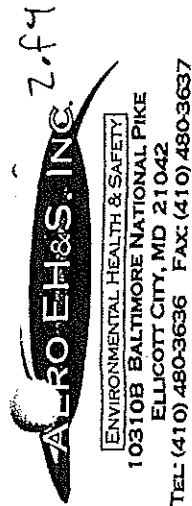
Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Friable? Y/N	Sample Description	Comments	Sample Number
Room 39	1	Misc.	2'x4'		G	Y	CT01 - 2'x4' Ceiling Tile w/ Gouges, Med. & Small Holes		071111-RCS-01
Gym Storage	1	Misc.	2'x4'		G	Y	CT02 - 2'x4' Smooth Ceiling Tile w/ Large & Small Holes		071111-RCS-02
Room 42	1	Misc.	2'x4'		G	Y	CT03 - 2'x4' Ceiling Tile w/ Nicks & Pinholes		071111-RCS-03
Hallway #5	1	Misc.	2'x4'		G	Y	CT04 - 2'x4' Ceiling Tile w/ EW Fissures, Med & Small Holes		071111-RCS-04
Hallway #5	1	Misc.	2'x4'		G	Y	CT05 - 2'x4' Batwing Fissures w/ Large Holes		071111-RCS-05
Pool	1	Misc.	1'x1'		G	Y	CT06 - 1'x1' Spline Tile w/ EW Fissures & small holes	u/mastic	071111-RCS-06
Pool	1	Misc.	1'x1'		G	Y	CT07 - 1'x1' Spline Tile w/ w/small holes	u/mastic	071111-RCS-07
Pool	1	Misc.	1'x1'		G	Y	CT08 - 2'x4' Smooth Ceiling Tile		071111-RCS-08
Room 35	1	Misc.	4"		G	N	CB01 - 4" Dark Gray Gable Gablebase Vinyl.	u/mastic	071111-RCS-09
Room 20	1	Misc.	4"		G	N	CB02 - 4" Vinyl J Tan Gablebase	u/mastic	071111-RCS-10
Room 40	1	Misc.	4"		G	N	CB03 - 4" Gray Vinyl Gablebase	u/mastic	071111-RCS-11
Hallway #6	1	Misc.	4"		G	N	CB05 - 4" Vinyl Black Gablebase	u/mastic	071111-RCS-12

Accepted ☒ Rejected ☐

Chain of Custody

Sampled By: Stephen Kelly
Signature:
Date/Time: 7/11/11 3:00pm
Received By:
Signature:
Date/Time: 7-13-11
Transported By:
Signature:
Date/Time: 7-13-11
Lab Custody:
Signature:
Date/Time: 7-13-11

BULK ASBESTOS SAMPLE SHEET



ENVIRONMENTAL HEALTH & SAFETY

10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Project Name: Rock Creek School - AHERA Re-inspection

Inspectors: Kelly Murphy

Project Location: Frederick, MD

Client/Job Number: _____

Date Sampled: 7/11/11

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Frangible? Y/N	Sample Description	Comments	Sample Number
Room 7	1	Misc.	4"		G	N	C806 - 4" Vinyl Forest Green Corobase	w/ mastic	071111-RCS-13
Room 56	1	Misc.	4"		G	N	C807 - 4" Vinyl Cream Corobase	w/ mastic	071111-RCS-14
Hallway #1	1	Misc.	12"x12"		G	N	FT02 - 12"x12" White/Tan FT w/ Brown Strakes White Specks	w/ mastic	071111-RCS-15
Room 15	1	Misc.	12"x12"		G	N	FT01 - 12"x12" White FT Under Carpet	w/ mastic	071111-RCS-16
34B	1	Misc.	12"x12"		G	N	FT03 - 12"x12" White FT w/ Brown & Green Specks	w/ mastic	071111-RCS-17
34B	1	Misc.	12"x12"		G	N	FT04 - 12"x12" Tan FT w/ Brown & White Long Strakes	w/ mastic	071111-RCS-18
Hallway #1	1	Misc.	12"x12"		G	N	FT05 - 1" wide Black Strip Tile	w/ mastic	071111-RCS-19
Room 6	1	Misc.	12"x12"		G	N	FT06 - 12"x12" Tan FT w/ Tan & White Mottle	w/ mastic	071111-RCS-20
Room 9	1	Misc.	12"x12"		G	N	FT07 - 12"x12" Cream FT w/ Green, Brown & White Mottle	w/ mastic	071111-RCS-21
Room 18	1	Misc.	12"x12"		G	N	FT08 - 12"x12" White FT w/ Blue Specks	w/ mastic	071111-RCS-22
Room 2	1	Misc.	12"x12"		G	N	FT09 - 12"x12" White FT w/ Green specks	w/ mastic	071111-RCS-23
Room 56	1	Misc.	12"x12"		G	N	FT15 - 12"x12" Tan FT w/ Light & Dark Tan Mottle	w/ mastic	071111-RCS-24

Chain of Custody

Sampled By: Stephen Kelly Received By: _____
 Signature: _____ Signature: _____
 Date/Time: 7/11/11 3:00 PM Date/Time: _____
 Transported By: _____
 Signature: _____
 Date/Time: _____
 Lab Custody: _____
 Signature: _____
 Date/Time: _____

BULK ASBESTOS SAMPLE SHEET



ENVIRONMENTAL HEALTH & SAFETY
10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Project Name: Rock Creek School - AHERA Re-inspection

Project Location: Frederick, MD Inspectors: Kelly / Murphy

Date Sampled: 7/11/11

Client/Job Number:

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Friable? Y/N	Sample Description	Comments	Sample Number
Main Lobby	1	Misc.	N/A		G	N	M01 - Black pipe wrap on F.G. insulated pipe		071111-RCS-25
Room 35	1	Misc.	N/A		G	N	M02 - Black pipe wrap on Roof Drain		071111-RCS-26
Hallway #1	1	Misc.	N/A		G	N	M05 - Black Tape wrap on Pipe		071111-RCS-27
Main Lobby	1	Misc.	N/A		G	N	M07 - White pipe wrap on F.G. Insulated Pipe		071111-RCS-28
Left #2	2	Misc.	N/A		G	N	M09 - White Seal mastic on Exhausting F.G. Duct		071111-RCS-29
Laundry Room	1	Misc.	N/A		G	N	M10 - Red Fire Stop		071111-RCS-30
Main Room & Storage	1	Misc.	N/A		G	N	M11 - White Sealer mastic on Foil wrapped Roof Drain		071111-RCS-31
Boiler Room	1	Misc.	N/A		G	N	M12 - White Sealer mastic on F.G. Boiler Insulation		071111-RCS-32
Room 11	1	Misc.	N/A		G	N	M13 - White mastic on Metal Roof Drain		071111-RCS-33
Room 25	1	Misc.	N/A		G	N	M14 - white mastic on Paper wrapped F.G. Insulated Roof Drain		071111-RCS-34
Hallway #1 Mechanical	1	TSI	N/A		G	Y	TSI01 - Mudded Insulation on Metal Duct	Positive Stop 1 of 3	071111-RCS-35
Hallway #1 Mechanical	1	TSI	N/A		G	Y	TSI02 - Mudded Insulation on Metal Duct	Positive Stop 2 of 3	071111-RCS-36

Chain of Custody

Sampled By: Stephen Kelly
Signature:
Date/Time: 7/11/11 3:00 PM

Received By: _____
Signature: _____
Date/Time: _____

Transported By: _____
Signature: _____
Date/Time: _____

Lab Custody: _____
Signature: _____
Date/Time: _____

4.49
AERO EH&S, INC.

ENVIRONMENTAL HEALTH & SAFETY
10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Requested Turnaround Time
 Immed. 24hr 3-day 5 day
 Results Needed By:

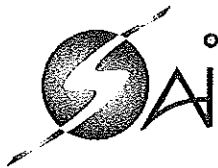
Project Name: Rock Creek School - AHERA - Re-inspection
 Project Location: Fredrick, MD
 Inspectors: Kelly / Murphy
 Date Sampled: 7/11/11
 Client/Job Number: _____

Client/Job Number:

[illegible]

Chain of Custody

Sampled By: Stephen Kelly
 Signature: [Signature]
 Date/Time: 7/7/11 3:00 PM
 Received By: _____
 Signature: _____
 Date/Time: _____
 Transported By: _____
 Lab Custody: _____
 Signature: _____
 Date/Time: _____



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Bonnie Barrows

Lab Order ID: 1111155

Analysis ID: 1111155PLM

Date Received: 8/10/2011

Date Reported: 8/11/2011

Project: Rock Creek School-AAERA Re-
Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
080811-RCS-01	M04-white end-cap mastic on cloth-wrapped pipe insulation	None Detected	70% Cellulose	30% Other	White Fibrous Heterogeneous
1111155PLM_1	mastic/wrap				Dissolved
080811-RCS-02	FT07-12"x12" cream FT w/ green, maroon, & white mottle	None Detected	5% Cellulose	95% Other	Gray, Yellow Non Fibrous Heterogeneous
1111155PLM_2	mastic/leveling				Dissolved
080811-RCS-03	M06-white end-cap mastic on FG pipe insulation (paper)	5% Chrysotile		95% Other	White Non Fibrous Heterogeneous
1111155PLM_3					Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

Dorlos Ammerman (3)

Analyst

Nathaniel Durham, MS or Approved Signatory

Scientific Analytical Institute, Inc. 302-L Pomona Dr. Greensboro, NC 27407 (336) 292-3888

Page 1 of 1

AERO-EHS, INC.
ENVIRONMENTAL HEALTH & SAFETY
10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Inspectors: Kelly

Project Location: Frederick, MD

Client/Job Number:

Date Sampled: 8/20/11

[illegible]

Sampled By: Stephen Kelly Received By: [Signature] Transported By: [Signature]
 Signature: [Signature] Signature: [Signature] Signature: [Signature]
 Date/Time: 8/8/11 1:00 PM Date/Time: 8-10-10A Date/Time: [Blank]



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



NVLAP
NVLAP Lab Code: 2006640

Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components		Non-Fibrous Components		Attributes
Lab Sample ID	Lab Notes						Treatment
071111-RCS-01	CT01-2X4 ceiling tile w/gouges, med & sm holes	None Detected	40%	Cellulose	20%	Other	White, Tan Fibrous Heterogeneous
1109772PLM_1			40%	Fiber Glass			Crushed
071111-RCS-02	CT02-2X4 smooth ceiling tile w/ lg & sm holes	None Detected	50%	Cellulose	10%	Perlite	White, Tan Fibrous Heterogeneous
1109772PLM_2			30%	Fiber Glass	10%	Other	Crushed
071111-RCS-03	CT03-2X4 ceiling tile w/nicks & pinholes	None Detected	60%	Cellulose	10%	Quartz	White, Tan Fibrous Heterogeneous
1109772PLM_3			20%	Fiber Glass	10%	Other	Crushed
071111-RCS-04	CT04-2X4 ceiling tile w/ EW fissures, med & sm holes	None Detected	50%	Cellulose	10%	Perlite	White, Tan Fibrous Heterogeneous
1109772PLM_4			30%	Fiber Glass	10%	Other	Crushed
071111-RCS-05	CT05-2X4 batwing fissures w/ lg holes	None Detected	40%	Cellulose	20%	Other	White, Tan Fibrous Heterogeneous
1109772PLM_5			40%	Fiber Glass			Crushed
071111-RCS-06	CT06-1X1 spline tile w. sm holes	None Detected	80%	Mineral Wool	20%	Other	White, Tan Fibrous Heterogeneous
1109772PLM_6							Crushed
071111-RCS-07	CT07-1X1 spline tile w/ sm holes	None Detected	70%	Mineral Wool	30%	Other	Gray, White Fibrous Heterogeneous
1109772PLM_7							Crushed
071111-RCS-08	CT08-2X4 smooth ceiling tile	None Detected	70%	Mineral Wool	30%	Other	Gray, White Fibrous Heterogeneous
1109772PLM_8							Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

Dorlos Ammerman (58)

Analyst

Nathaniel Durham, MS or Approved Signatory

Scientific Analytical Institute, Inc. 302-L Pomona Dr. Greensboro, NC 27407 (336) 292-3888

Page 1 of 8



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-09 - A	CB01-4" dk. Grey covebase vinyl	None Detected		100% Other	Gray Non Fibrous Homogeneous
1109772PLM_9	covebase				Ashed
071111-RCS-09 - B	CB01-4" dk. Grey covebase vinyl	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1109772PLM_41	mastic				Dissolved
071111-RCS-10 - A	CB02-4" vinyl tan covebase	None Detected		100% Other	Tan Non Fibrous Homogeneous
1109772PLM_10	covebase				Ashed
071111-RCS-10 - B	CB02-4" vinyl tan covebase	None Detected		100% Other	Brown Non Fibrous Heterogeneous
1109772PLM_42	mastic-small sample				Dissolved
071111-RCS-11 - A	CB03-4" gray vinyl covebase	None Detected		100% Other	Gray Non Fibrous Homogeneous
1109772PLM_11	covebase				Ashed
071111-RCS-11 - B	CB03-4" gray vinyl covebase	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1109772PLM_43	mastic				Dissolved
071111-RCS-12 - A	CB05-4" vinyl black coverbase	None Detected		100% Other	Black Non Fibrous Homogeneous
1109772PLM_12	covebase				Ashed
071111-RCS-12 - B	CB05-4" vinyl black coverbase	None Detected	2% Other	98% Other	Brown, Tan Non Fibrous Heterogeneous
1109772PLM_44	mixed mastic				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

Dorlos Ammerman (58)

Analyst

Nathaniel Durham, MS or Approved Signatory

Scientific Analytical Institute, Inc. 302-L Pomona Dr. Greensboro, NC 27407 (336) 292-3888

Page 2 of 8



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



NVLAP
NVLAP Lab Code: 2008640

Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-13 - A	CB06-4" vinyl forest green covebase	None Detected		100% Other	Green Non Fibrous Homogeneous
1109772PLM_13	covebase				Ashed
071111-RCS-13 - B	CB06-4" vinyl forest green covebase	None Detected	2% Other	98% Other	Brown, Tan Non Fibrous Heterogeneous
1109772PLM_45	mixed mastic				Dissolved
071111-RCS-14 - A	CB07-4" vinyl cream covebase	None Detected		100% Other	Cream Non Fibrous Homogeneous
1109772PLM_14	covebase				Ashed
071111-RCS-14 - B	CB07-4" vinyl cream covebase	None Detected	2% Other	98% Other	Brown, Tan Non Fibrous Heterogeneous
1109772PLM_46	mixed mastic				Dissolved
071111-RCS-15 - A	FT02-12X12 white/tan ft w/ brown streaks & white specks	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous
1109772PLM_15	tile				Dissolved
071111-RCS-15 - B	FT02-12X12 white/tan ft w/ brown streaks & white specks	5% Chrysotile		95% Other	Black Non Fibrous Heterogeneous
1109772PLM_47	mastic				Dissolved
071111-RCS-16 - A	FT01-12X12 white ft under carpet	None Detected	2% Cellulose	98% Other	Green, Yellow Non Fibrous Heterogeneous
1109772PLM_16	top mastic				Dissolved
071111-RCS-16 - B	FT01-12X12 white ft under carpet	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous
1109772PLM_48	tile				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

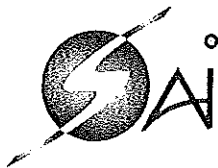
Dorlos Ammerman (58)

Analyst

Nathaniel Durham, MS or Approved Signatory

Scientific Analytical Institute, Inc. 302-L Pomona Dr. Greensboro, NC 27407 (336) 292-3888

Page 3 of 8



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-16 - C	FT01-12X12 white ft under carpet	5% Chrysotile		95% Other	Black Non Fibrous Heterogeneous
1109772PLM_49	bottom mastic				Dissolved
071111-RCS-17 - A	FT03-12X12 white ft w/brown & grey specks	None Detected		100% Other	White Non Fibrous Heterogeneous
1109772PLM_17	tile				Dissolved
071111-RCS-17 - B	FT03-12X12 white ft w/brown & grey specks	5% Chrysotile		95% Other	Black Non Fibrous Heterogeneous
1109772PLM_50	mastic				Dissolved
071111-RCS-18 - A	FT04-12X12 tan ft w/ brown & white long steaks	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1109772PLM_18	tile				Dissolved
071111-RCS-18 - B	FT04-12X12 tan ft w/ brown & white long steaks	5% Chrysotile		95% Other	Black Non Fibrous Heterogeneous
1109772PLM_51	mastic				Dissolved
071111-RCS-19 - A	FT05-1" wide black strip tile	4% Chrysotile		96% Other	Black Non Fibrous Heterogeneous
1109772PLM_19	tile				Dissolved
071111-RCS-19 - B	FT05-1" wide black strip tile	5% Chrysotile		95% Other	Black Non Fibrous Heterogeneous
1109772PLM_52	mastic				Dissolved
071111-RCS-20 - A	FT06-12X12 tan ft w/ tan&white mottle	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1109772PLM_20	tile				Dissolved

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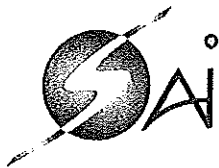
Dorlos Ammerman (58)

Analyst

Nathaniel Durham, MS or Approved Signatory

Scientific Analytical Institute, Inc. 302-L Pomona Dr. Greensboro, NC 27407 (336) 292-3888

Page 4 of 8



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-20 - B	FT06-12X12 tan ft w/ tan&white mottle	None Detected	2% Cellulose	98% Other	Yellow Non Fibrous Heterogeneous
1109772PLM_53	mastic				Dissolved
071111-RCS-21 - A	FT07-12X12 cream ft w/ green, maroon & white mottle	None Detected		100% Other	Cream Non Fibrous Heterogeneous
1109772PLM_21	tile				Dissolved
071111-RCS-21 - B	FT07-12X12 cream ft w/ green, maroon & white mottle	Insufficient Sample			
1109772PLM_54	mastic				
071111-RCS-22 - A	FT08-12X12 white ft w/ blue specks	None Detected		100% Other	White Non Fibrous Heterogeneous
1109772PLM_22	tile				Dissolved
071111-RCS-22 - B	FT08-12X12 white ft w/ blue specks	5% Chrysotile		95% Other	White Non Fibrous Heterogeneous
1109772PLM_55	mixed mastic				Dissolved
071111-RCS-23 - A	FT09-12X12 white ft w/ grey specks	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1109772PLM_23	tile				Dissolved
071111-RCS-23 - B	FT09-12X12 white ft w/ grey specks	None Detected	3% Cellulose	97% Other	Yellow Non Fibrous Heterogeneous
1109772PLM_56	mastic				Dissolved
071111-RCS-24 - A	FT15-12X12 tan ft w/ light & dk tan mottle	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1109772PLM_24	tile				Dissolved

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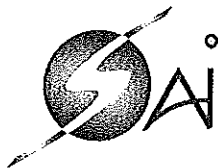
Dorlos Ammerman (58)

Analyst

Nathaniel Durham, MS or Approved Signatory

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components		Non-Fibrous Components		Attributes
Lab Sample ID	Lab Notes						Treatment
071111-RCS-24 - B	FT15-12X12 tan ft w/ light & dk tan mottle	None Detected	3%	Cellulose	97%	Other	Yellow Non Fibrous Heterogeneous
1109772PLM_57	mastic						Dissolved
071111-RCS-25	M01-black pipe wrap on f.g. insulated pipe	8% Chrysotile	12%	Cellulose	80%	Other	Black Non Fibrous Heterogeneous
1109772PLM_25							Dissolved
071111-RCS-26	M02-black pipe wrap on roof drain	None Detected	20%	Cellulose	80%	Other	Black Non Fibrous Heterogeneous
1109772PLM_26							Dissolved
071111-RCS-27	M05 -black tape wrap on pipe	8% Chrysotile	10%	Cellulose	82%	Other	Tan, Black Non Fibrous Heterogeneous
1109772PLM_27							Dissolved
071111-RCS-28	M07-white pipe wrap on f.g. insulated pipe	8% Chrysotile	20%	Cellulose	72%	Other	White Fibrous Heterogeneous
1109772PLM_28	wrap/mastic						Dissolved
071111-RCS-29	M09-white seam mastic on cloth wrapped f.g. duct	None Detected	80%	Cellulose	20%	Other	White Fibrous Heterogeneous
1109772PLM_29	wrap/mastic						Dissolved
071111-RCS-30	M10-red fire stop	None Detected			100%	Other	Yellow Non Fibrous Heterogeneous
1109772PLM_30							Dissolved
071111-RCS-31	M11-white seam mastic on foil wrapped roof drain	5% Chrysotile	55% 10%	Cellulose Fiber Glass	30%	Other	Tan, White Fibrous Heterogeneous
1109772PLM_31	wrap/mastic						Dissolved

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-32	M12-white seam mastic on f.g. boiler insulation	None Detected	70% Cellulose	30% Other	Tan, White Fibrous Heterogeneous
1109772PLM_32	wrap/mastic				Dissolved
071111-RCS-33 - A	M13-white mastic on metal roof drain	8% Chrysotile		92% Other	White Non Fibrous Heterogeneous
1109772PLM_33	mastic				Dissolved
071111-RCS-33 - B	M13-white mastic on metal roof drain	None Detected	40% Cellulose 40% Fiber Glass	20% Other	Tan Fibrous Heterogeneous
1109772PLM_58	insulation				Crushed
071111-RCS-34	M14-white mastic on paper wrapped f.g. insulated roof drain	8% Chrysotile	10% Cellulose 10% Fiber Glass	72% Other	White Fibrous Heterogeneous
1109772PLM_34	wrap/mastic				Dissolved
071111-RCS-35	TSI01-mudded insulation on metal duct	10% Chrysotile	10% Cellulose 10% Fiber Glass	70% Other	Gray Fibrous Heterogeneous
1109772PLM_35	unable to separate wrap				Crushed
071111-RCS-36	TSF01-mudded insulation on metal duct	Not Analyzed			
1109772PLM_36					
071111-RCS-37	TSI03-mudded pipe fitting on 1-3"	None Detected	30% Mineral Wool	70% Other	Gray Fibrous Heterogeneous
1109772PLM_37					Crushed
071111-RCS-38	TSI03-mudded pipe fitting on 1-3"	None Detected	30% Mineral Wool	70% Other	Gray Fibrous Heterogeneous
1109772PLM_38					Crushed

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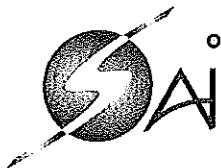
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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



NVLAP

NVLAP Lab Code: 20884-0

Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1109772

Analysis ID: 1109772PLM

Date Received: 7/13/2011

Date Reported: 7/15/2011

Project: Rock Creek School-AHERA Inspection,
Frederick, MD

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
071111-RCS-39	TSI03-mudded pipe fitting on 1-3"	None Detected	30% Mineral Wool	70% Other	Gray Fibrous Heterogeneous
1109772PLM_39					Crushed
071111-RCS-40	TSI01-mudded insulation on metal duct	Not Analyzed			
1109772PLM_40					

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Appendix C- Room-by-Room ACM Inventory

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
1	Rock Creek-7	Caulking, Door	Beige	45	LF
1	Rock Creek-9	Caulking, Window	Beige	15	LF
1	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
2	Rock Creek-7	Caulking, Door	Beige	45	LF
2	Rock Creek-8	Sealant, Sink	Black	4	SF
2	Rock Creek-9	Caulking, Window	Beige	15	LF
2	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
3	Rock Creek-7	Caulking, Door	Beige	45	LF
3	Rock Creek-9	Caulking, Window	Beige	15	LF
3	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
4	Rock Creek-7	Caulking, Door	Beige	45	LF
4	Rock Creek-8	Sealant, Sink	Black	4	SF
4	Rock Creek-9	Caulking, Window	Beige	15	LF
4	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
6	Rock Creek-7	Caulking, Door	Beige	45	LF
6	Rock Creek-8	Sealant, Sink	Black	4	SF
6	Rock Creek-9	Caulking, Window	Beige	15	LF
6	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
7	Rock Creek-7	Caulking, Door	Beige	45	LF
7	Rock Creek-8	Sealant, Sink	Black	4	SF
7	Rock Creek-9	Caulking, Window	Beige	15	LF
7	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
8	Rock Creek-7	Caulking, Door	Beige	45	LF
8	Rock Creek-8	Sealant, Sink	Black	4	SF
8	Rock Creek-9	Caulking, Window	Beige	15	LF
8	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
9	Rock Creek-7	Caulking, Door	Beige	45	LF
9	Rock Creek-8	Sealant, Sink	Black	4	SF
9	Rock Creek-9	Caulking, Window	Beige	15	LF
9	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
Hallway # 2	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	770	SF
Hallway # 2	Rock Creek-7	Caulking, Door	Beige	42	LF
10	Rock Creek-7	Caulking, Door	Beige	45	LF
10	Rock Creek-8	Sealant, Sink	Black	4	SF
10	Rock Creek-9	Caulking, Window	Beige	15	LF
10	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
11	Rock Creek-7	Caulking, Door	Beige	45	LF
11	Rock Creek-8	Sealant, Sink	Black	4	SF
11	Rock Creek-9	Caulking, Window	Beige	15	LF
11	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
12	Rock Creek-7	Caulking, Door	Beige	45	LF
12	Rock Creek-8	Sealant, Sink	Black	4	SF
12	Rock Creek-9	Caulking, Window	Beige	15	LF
12	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
13	Rock Creek-7	Caulking, Door	Beige	45	LF
13	Rock Creek-8	Sealant, Sink	Black	4	SF
13	Rock Creek-9	Caulking, Window	Beige	15	LF
13	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
14	Rock Creek-7	Caulking, Door	Beige	45	LF
14	Rock Creek-8	Sealant, Sink	Black	4	SF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
14	Rock Creek-9	Caulking, Window	Beige	15	LF
14	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
15	Rock Creek-7	Caulking, Door	Beige	45	LF
15	Rock Creek-8	Sealant, Sink	Black	4	SF
15	Rock Creek-9	Caulking, Window	Beige	15	LF
15	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
16	Rock Creek-7	Caulking, Door	Beige	45	LF
16	Rock Creek-8	Sealant, Sink	Black	4	SF
16	Rock Creek-9	Caulking, Window	Beige	15	LF
16	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
17	Rock Creek-7	Caulking, Door	Beige	45	LF
17	Rock Creek-8	Sealant, Sink	Black	4	SF
17	Rock Creek-9	Caulking, Window	Beige	15	LF
17	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
Hallway # 6	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	770	SF
Hallway # 6	Rock Creek-7	Caulking, Door	Beige	42	LF
Home Economics	Rock Creek-7	Caulking, Door	Beige	84	LF
Home Economics	Rock Creek-9	Caulking, Window	Beige	40	LF
Hallway # 5	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	550	SF
Hallway # 5	Rock Creek-7	Caulking, Door	Beige	52	LF
Hallway # 5	Rock Creek-9	Caulking, Window	Beige	26	LF
Hallway # 5	Rock Creek-34	Window Glazing	White	26	SF
Hallway # 4	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	550	SF
Hallway # 4	Rock Creek-7	Caulking, Door	Beige	21	LF
Industrial Arts	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	960	SF
Industrial Arts	Rock Creek-7	Caulking, Door	Beige	40	LF
Industrial Arts	Rock Creek-9	Caulking, Window	Beige	36	LF
Storage (Hallway #5)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	168	SF
Storage (Hallway #5)	Rock Creek-7	Caulking, Door	Beige	15	LF
75	Rock Creek-7	Caulking, Door	Beige	15	LF
76	Rock Creek-7	Caulking, Door	Beige	15	LF
Gymnasium	Rock Creek-9	Caulking, Window	Beige	104	LF
Gymnasium	Rock Creek-34	Window Glazing	White	100	SF
Gymnasium	Rock Creek-7	Caulking, Door	Beige	78	LF
Hallway # 3	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	770	SF
Hallway # 3	Rock Creek-7	Caulking, Door	Beige	144	LF
Physical Therapy	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	715	SF
Physical Therapy	Rock Creek-7	Caulking, Door	Beige	54	LF
Speech Office	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	240	SF
Speech Office	Rock Creek-7	Caulking, Door	Beige	18	LF
Speech Office	Rock Creek-9	Caulking, Window	Beige	15	LF
Vocational Therapy	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	830	SF
Vocational Therapy	Rock Creek-7	Caulking, Door	Beige	54	LF
Vocational Therapy	Rock Creek-9	Caulking, Window	Beige	15	LF
Vocational Therapy	Rock Creek-8	Sealant, Sink	Black	4	SF
Music	Rock Creek-7	Caulking, Door	Beige	36	LF
Music	Rock Creek-9	Caulking, Window	Beige	15	LF
Music (Closet)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	60	SF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
Arts & Crafts	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	700	SF
Arts & Crafts	Rock Creek-7	Caulking, Door	Beige	36	LF
Arts & Crafts	Rock Creek-9	Caulking, Window	Beige	15	LF
Arts & Crafts (Closet)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	60	SF
Stage Storage	Rock Creek-19	Duct Insulation	White	100	SF
Storage (Hallway #3)	Rock Creek-19	Duct Insulation	White	50	SF
20	Rock Creek-19	Duct Insulation	White	40	SF
Mechanical (Hallway #1)	Rock Creek-19	Duct Insulation	White	300	SF
Teachers' Room	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	680	SF
Teachers' Room	Rock Creek-8	Sealant, Sink	Black	4	SF
Teachers' Room	Rock Creek-7	Caulking, Door	Beige	75	SF
Admin. Office-Hallway	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	550	SF
Asst. Principal	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	196	SF
Asst. Principal	Rock Creek-7	Caulking, Door	Beige	18	LF
Asst. Principal	Rock Creek-9	Caulking, Window	Beige	15	LF
92	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	185	LF
92	Rock Creek-7	Caulking, Door	Beige	18	LF
92	Rock Creek-9	Caulking, Window	Beige	15	LF
Social	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	185	LF
Principal	Rock Creek-7	Caulking, Door	Beige	18	LF
Principal	Rock Creek-9	Caulking, Window	Beige	15	LF
Principal	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	196	SF
Principal	Rock Creek-7	Caulking, Door	Beige	18	LF
Principal	Rock Creek-9	Caulking, Window	Beige	15	LF
Social Worker	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	200	SF
96	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	200	SF
Gen. Office	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	350	SF
Admin Storage	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	200	SF
Supply room (Storage next to Mail Room)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	200	SF
Cafeteria	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	3500	SF
Cafeteria	Rock Creek-7	Caulking, Door	Beige	52	LF
Cafeteria	Rock Creek-9	Caulking, Window	Beige	150	LF
Cafeteria	Rock Creek-34	Window Glazing	White	216	SF
Kitchen	Rock Creek-7	Caulking, Door	Beige	108	LF
72	Rock Creek-7	Caulking, Door	Beige	18	LF
72	Rock Creek-9	Caulking, Window	Beige	45	LF
Hallway # 7	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	700	SF
Hallway # 7	Rock Creek-7	Caulking, Door	Beige	42	LF
23 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
23 (storage)	Rock Creek-7	Caulking, Door	Beige	18	LF
23	Rock Creek-7	Caulking, Door	Beige	36	LF
23	Rock Creek-9	Caulking, Window	Beige	15	LF
23	Rock Creek-8	Sealant, Sink	Black	4	SF
24 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
24 (storage)	Rock Creek-7	Caulking, Door	Beige	18	LF
24	Rock Creek-7	Caulking, Door	Beige	36	LF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
24	Rock Creek-9	Caulking, Window	Beige	15	LF
24	Rock Creek-8	Sealant, Sink	Black	4	SF
25 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
25 (storage)	Rock Creek-7	Caulking, Door	Beige	18	LF
25	Rock Creek-7	Caulking, Door	Beige	36	LF
25	Rock Creek-9	Caulking, Window	Beige	15	LF
25	Rock Creek-8	Sealant, Sink	Black	4	SF
26 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
26 (storage)	Rock Creek-7	Caulking, Door	Beige	18	LF
26	Rock Creek-7	Caulking, Door	Beige	36	LF
26	Rock Creek-9	Caulking, Window	Beige	15	LF
26	Rock Creek-8	Sealant, Sink	Black	4	SF
East Lobby	Rock Creek-7	Caulking, Door	Beige	36	LF
East Lobby	Rock Creek-9	Caulking, Window	Beige	24	LF
East Lobby	Rock Creek-34	Window Glazing	White	36	SF
56 Suite	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	455	SF
56 Suite	Rock Creek-7	Caulking, Door	Beige	72	LF
56 Suite	Rock Creek-9	Caulking, Window	Beige	40	LF
ELL Restroom	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	220	SF
ELL Restroom	Rock Creek-7	Caulking, Door	Beige	36	LF
27 (dark room)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	40	SF
28 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	50	SF
28	Rock Creek-7	Caulking, Door	Beige	72	LF
28	Rock Creek-9	Caulking, Window	Beige	15	LF
28	Rock Creek-8	Sealant, Sink	Black	4	SF
29 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	50	SF
29	Rock Creek-7	Caulking, Door	Beige	72	LF
29	Rock Creek-9	Caulking, Window	Beige	15	LF
29	Rock Creek-8	Sealant, Sink	Black	4	SF
30 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	50	SF
30	Rock Creek-7	Caulking, Door	Beige	72	LF
30	Rock Creek-9	Caulking, Window	Beige	15	LF
30	Rock Creek-8	Sealant, Sink	Black	4	SF
31 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	50	SF
31	Rock Creek-7	Caulking, Door	Beige	72	LF
31	Rock Creek-9	Caulking, Window	Beige	15	LF
31	Rock Creek-8	Sealant, Sink	Black	4	SF
32 (dark room)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	40	SF
33	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	650	SF
33	Rock Creek-7	Caulking, Door	Beige	36	LF
33	Rock Creek-9	Caulking, Window	Beige	15	LF
33	Rock Creek-8	Sealant, Sink	Black	4	SF
34 Suite	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	650	SF
34 Suite	Rock Creek-7	Caulking, Door	Beige	36	LF
34 Suite	Rock Creek-9	Caulking, Window	Beige	15	LF
34 Suite	Rock Creek-8	Sealant, Sink	Black	4	SF
Mech. Restroom	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	80	SF
Mech. Restroom	Rock Creek-7	Caulking, Door	Beige	18	LF
Boiler room	Rock Creek-7	Caulking, Door	Beige	36	LF
Boiler room	DWJC	Joint Compound	White	1110	SF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
Boiler room	M08	Seam Mastic on Fiberglass	White	500	LF
Mech. Custodial	Rock Creek-7	Caulking, Door	Beige	18	LF
Main Lobby	Rock Creek-7	Caulking, Door	Beige	40	LF
Main Lobby	Rock Creek-9	Caulking, Window	Beige	100	LF
Main Lobby	Rock Creek-34	Window Glazing	White	145	SF
33	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	120	SF
33	Rock Creek-7	Caulking, Door	Beige	18	LF
34 Suite	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	930	SF
34 Suite	Rock Creek-7	Caulking, Door	Beige	90	LF
35	Rock Creek-7	Caulking, Door	Beige	18	LF
35	Rock Creek-9	Caulking, Window	Beige	15	LF
36	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	130	SF
36	Rock Creek-7	Caulking, Door	Beige	18	LF
37	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	320	SF
37	Rock Creek-7	Caulking, Door	Beige	18	LF
37	Rock Creek-9	Caulking, Window	Beige	15	LF
38	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	130	SF
38	Rock Creek-7	Caulking, Door	Beige	18	LF
39	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	320	SF
39	Rock Creek-7	Caulking, Door	Beige	18	LF
39	Rock Creek-9	Caulking, Window	Beige	15	LF
40	Rock Creek-7	Caulking, Door	Beige	18	LF
40	Rock Creek-9	Caulking, Window	Beige	30	LF
40 (storage)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	90	SF
Custodial Closet (Hallway #1)	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	45	SF
Custodial Closet (Hallway #1)	Rock Creek-7	Caulking, Door	Beige	18	LF
41	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	120	SF
41	Rock Creek-7	Caulking, Door	Beige	18	LF
42	Rock Creek-7	Caulking, Door	Beige	18	LF
42	Rock Creek-9	Caulking, Window	Beige	30	LF
43	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	400	SF
43	Rock Creek-7	Caulking, Door	Beige	18	LF
Hallway # 1	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	550	SF
10	M01	Wrap on Pipe	Black	4	LF
10	M03	Mastic on Fiberglass Insulation	Black	15	LF
10	M13	Metal Roof Drain Bowl	White	2	LF
11	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
11	M08	Seam Mastic on Fiberglass	White	20	LF
11	M13	Metal Roof Drain Bowl	White	2	LF
12	DWJC	Joint Compound	White	80	SF
13	DWJC	Joint Compound	White	80	SF
13	M01	Wrap on Pipe	Black	3	LF
13	M03	Mastic on Fiberglass Insulation	Black	15	LF
15	DWJC	Joint Compound	White	80	SF
16	DWJC	Joint Compound	White	80	SF
16	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
16	M08	Seam Mastic on Fiberglass	White	20	LF
16	M13	Metal Roof Drain Bowl	White	2	LF
17	M01	Wrap on Pipe	Black	12	LF
17	M03	Mastic on Fiberglass Insulation	Black	40	LF
17	M07	Pipe wrap on Fiberglass Pipe	White	2	LF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
17	M08	Seam Mastic on Fiberglass	White	25	LF
17	M13	Metal Roof Drain Bowl	White	2	LF
2	DWJC	Joint Compound	White	80	SF
2	M01	Wrap on Pipe	Black	2	LF
2	M03	Mastic on Fiberglass Insulation	Black	30	LF
24	DWJC	Joint Compound	White	80	SF
24	M01	Wrap on Pipe	Black	5	LF
24	M03	Mastic on Fiberglass Insulation	Black	15	LF
25	DWJC	Joint Compound	White	80	SF
25	M01	Wrap on Pipe	Black	5	LF
25	M03	Mastic on Fiberglass Insulation	Black	20	LF
25	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
25	M08	Seam Mastic on Fiberglass	White	10	LF
25	M14	Mastic on Paper	White	2	LF
26	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
26	M08	Seam Mastic on Fiberglass	White	15	LF
26	M14	Mastic on Paper	White	2	LF
28	DWJC	Joint Compound	White	130	SF
28	M01	Wrap on Pipe	Black	7	LF
28	M03	Mastic on Fiberglass Insulation	Black	15	LF
29	DWJC	Joint Compound	White	130	SF
29	M01	Wrap on Pipe	Black	6	LF
29	M03	Mastic on Fiberglass Insulation	Black	20	LF
3	DWJC	Joint Compound	White	200	SF
3	M01	Wrap on Pipe	Black	6	LF
3	M03	Mastic on Fiberglass Insulation	Black	15	LF
3	M07	Pipe wrap on Fiberglass Pipe	White	4	LF
3	M08	Seam Mastic on Fiberglass	White	5	LF
30	DWJC	Joint Compound	White	130	SF
30	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
30	M08	Seam Mastic on Fiberglass	White	10	LF
31	DWJC	Joint Compound	White	130	SF
31	M07	Pipe wrap on Fiberglass Pipe	White	4	LF
31	M08	Seam Mastic on Fiberglass	White	15	LF
31	M14	Mastic on Paper	White	2	LF
33	DWJC	Joint Compound	White	100	SF
34 Suite	M03	Mastic on Fiberglass Insulation	Black	15	LF
35	M01	Wrap on Pipe	Black	5	LF
37	M03	Mastic on Fiberglass Insulation	Black	8	LF
38	M03	Mastic on Fiberglass Insulation	Black	20	LF
4	M01	Wrap on Pipe	Black	4	LF
4	M03	Mastic on Fiberglass Insulation	Black	10	LF
40	DWJC	Joint Compound	White	10	SF
40	M01	Wrap on Pipe	Black	5	LF
40	M03	Mastic on Fiberglass Insulation	Black	60	LF
41	DWJC	Joint Compound	White	100	SF
41A					
42	DWJC	Joint Compound	White	10	SF
42	M01	Wrap on Pipe	Black	8	LF
42	M03	Mastic on Fiberglass Insulation	Black	60	LF
5					
6	M01	Wrap on Pipe	Black	4	LF
6	M03	Mastic on Fiberglass Insulation	Black	15	LF
6	M05	Paper Wrap on Pipe	Black	2	LF
7	M01	Wrap on Pipe	Black	12	LF
7	M03	Mastic on Fiberglass Insulation	Black	20	LF
8	DWJC	Joint Compound	White	80	SF
8	M01	Wrap on Pipe	Black	3	LF
8	M03	Mastic on Fiberglass Insulation	Black	20	LF
8	M05	Paper Wrap on Pipe	Black	2	LF
9	DWJC	Joint Compound	White	80	SF
9	M01	Wrap on Pipe	Black	8	LF
9	M03	Mastic on Fiberglass Insulation	Black	5	LF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
9	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
9	M08	Seam Mastic on Fiberglass	White	15	LF
Boiler room	M06	Endcap Mastic Wrap on Pipe	White	450	LF
Home Economics	DWJC	Joint Compound	White	2860	SF
Home Economics	M01	Wrap on Pipe	Black	40	LF
Home Economics	M03	Mastic on Fiberglass Insulation	Black	100	LF
Home Economics	M06	Endcap Mastic Wrap on Pipe	White	3	LF
Kitchen	M01	Wrap on Pipe	Black	60	LF
Kitchen	M03	Mastic on Fiberglass Insulation	Black	120	LF
Kitchen	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
Kitchen	M08	Seam Mastic on Fiberglass	White	5	LF
Kitchen	M11	Mastic on Foil Wrap	White	1	LF
Kitchen	TSI04	12" Block Pipe Hanger Insulation	White	6	EA
Industrial Arts	M07	Pipe wrap on Fiberglass Pipe	White	2	LF
Industrial Arts	M08	Seam Mastic on Fiberglass	White	30	LF
Arts & Crafts	DWJC	Joint Compound	White	160	SF
Arts & Crafts	M11	Mastic on Foil Wrap	White	2	LF
Asst. Principal	M01	Wrap on Pipe	Black	8	LF
Asst. Principal	M03	Mastic on Fiberglass Insulation	Black	60	LF
Asst. Principal	M06	Endcap Mastic Wrap on Pipe	White	6	LF
Principal	M03	Mastic on Fiberglass Insulation	Black	25	LF
Server Room	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	64	SF
75,76	M01	Wrap on Pipe	Black	12	LF
75,76	M03	Mastic on Fiberglass Insulation	Black	30	LF
Physical Therapy	M08	Seam Mastic on Fiberglass	White	30	LF
Vocational Therapy	DWJC	Joint Compound	White	60	SF
Vocational Therapy	M01	Wrap on Pipe	Black	5	LF
Vocational Therapy	M03	Mastic on Fiberglass Insulation	Black	15	LF
Laundry	DWJC	Joint Compound	White	176	SF
Laundry	M01	Wrap on Pipe	Black	10	LF
Laundry	M03	Mastic on Fiberglass Insulation	Black	30	LF
Music	DWJC	Joint Compound	White	120	SF
Music	M06	Endcap Mastic Wrap on Pipe	White	5	LF
Music	M08	Seam Mastic on Fiberglass	White	15	LF
Feeding Room	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	220	SF
Feeding Room	M01	Wrap on Pipe	Black	3	LF
Feeding Room	M03	Mastic on Fiberglass Insulation	Black	10	LF
Girls' Locker	M01	Wrap on Pipe	Black	6	LF
Girls' Locker	M03	Mastic on Fiberglass Insulation	Black	4	LF
Gym Office	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	48	SF
Mechanical (Hallway #1)	TSI02	1" - 3" Block Pipe Hanger Insulation	White	2	EA
Custodial Closet (Hallway #1)	M01	Wrap on Pipe	Black	4	LF
Custodial Closet (Hallway #1)	M03	Mastic on Fiberglass Insulation	Black	10	LF
Men's Room (Hallway #1)	DWJC	Joint Compound	White	40	SF
Women's Room (Hallway #1)	DWJC	Joint Compound	White	24	SF
Custodial Closet (Hallway #3)	DWJC	Joint Compound	White	24	SF
Girls' Restroom (Hallway #3)	M01	Wrap on Pipe	Black	5	LF
Girls' Restroom (Hallway #3)	M03	Mastic on Fiberglass Insulation	Black	10	LF
Home Economics	S1	Smooth 2 Coat Plaster	White	260	SF
Mail Room	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	292	SF
Mail Room	M06	Endcap Mastic Wrap on Pipe	White	5	SF
Mail Room	M08	Seam Mastic on Fiberglass	White	25	SF
Mail Room	M11	Mastic on Foil Wrap	White	2	LF

Rock Creek School

Room Number	Homogeneous Area	Material	Material Color	Quantity	Units
Mech. Hallway	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	220	SF
Mech. Hallway	M01	Wrap on Pipe	Black	5	LF
Mech. Hallway	M03	Mastic on Fiberglass Insulation	Black	10	LF
Mech. Hallway	M08	Seam Mastic on Fiberglass	White	3	LF
Stage	DWJC	Joint Compound	White	300	SF
Stage	FT02	Floor Tile and Mastic (12"x12")	White & tan with brown streaks & white specks	45	SF
Teachers' Room	M01	Wrap on Pipe	Black	12	LF
Teachers' Room	M03	Mastic on Fiberglass Insulation	Black	100	LF
Teachers' Room	M07	Pipe wrap on Fiberglass Pipe	White	4	LF
Teachers' Room	M08	Seam Mastic on Fiberglass	White	120	LF

Appendix D- XRF Results

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
Data Collection Date 10/20/2017 – Xlp 303A									
1	Calibration							Positive	1.1
2	Calibration							Positive	1.1
3	Calibration							Positive	1.0
4	Wall	Concrete	A	Intact	Purple	Second	1	Negative	0.01
5	Wall	Concrete	B	Intact	Purple	Second	1	Negative	0.02
6	Wall	Concrete	C	Intact	Purple	Second	1	Negative	0.03
7	Wall	Concrete	D	Intact	Purple	Second	1	Negative	0.03
8	Wall	Drywall	D	Intact	Purple	Second	1	Negative	0
9	Exit Door	Metal	A	Intact	Red	First	1	Negative	0.11
10	Exit Door Frame	Metal	A	Intact	Red	First	1	Negative	0.06
11	Closet Door Frame	Wood	A	Intact	White	First	1	Negative	0.06
12	Entry Door Frame	Metal	C	Intact	White	First	1	Negative	0.04
13	Entry Door Frame	Metal	C	Intact	White	First	1	Negative	0.01
14	Wall	Concrete	A	Intact	White	First	1 Closet	Negative	0.03
15	Wall	Concrete	B	Intact	White	First	1 Closet	Negative	0.01
16	Wall	Concrete	C	Intact	White	First	1 Closet	Negative	0.02
17	Wall	Concrete	D	Intact	White	First	1 Closet	Negative	0.03
18	Door	Wood	D	Intact	Brown	First	1 Closet	Negative	0.4
19	Door Frame	Metal	D	Intact	White	First	1 Closet	Negative	0.04
20	Wall	Concrete	A	Intact	White	First	3 Health Suite	Negative	0.02
21	Wall	Drywall	B	Intact	White	First	3 Health Suite	Negative	0
22	Wall	Concrete	C	Intact	White	First	3 Health Suite	Negative	0.05
23	Wall	Concrete	D	Intact	White	First	3 Health Suite	Negative	0.06
24	Office Window Frame	Metal	C	Intact	Gray	First	3 Health Suite	Negative	0
25	Exit Door	Wood	A	Intact	Black	First	3 Health Suite	Negative	0.09
26	Exit Door Frame	Metal	A	Intact	Black	First	3 Health Suite	Negative	0.26
27	Bathroom Door	Wood	C	Intact	Brown	First	3 Health Suite	Negative	0.5
28	Bathroom Door Frame	Metal	C	Intact	Black	First	3 Health Suite	Negative	0.01
29	Entry Door Frame	Metal	C	De	Black	First	3 Health Suite	Negative	0
30	Nurse Office Door Frame	Metal	C	De	Black	First	3 Health Suite	Negative	0.01
31	Window Casing	Metal	A	Intact	Black	First	3 Health Suite	Negative	0
32	Wall	Concrete	A	Intact	White	First	3 Nurse Office	Negative	0.02
33	Wall	Concrete	B	Intact	White	First	3 Nurse Office	Negative	0.01
34	Wall	Concrete	C	Intact	White	First	3 Nurse Office	Negative	0.01
35	Wall	Concrete	D	Intact	White	First	3 Nurse Office	Negative	0.03
36	Window Trim	Metal	A	Intact	Gray	First	3 Nurse Office	Negative	0
37	Door Frame	Metal	B	Intact	Black	First	3 Nurse Office	Negative	0.01

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
38	Wall	Concrete	A	Intact	White	First	3 Bathroom	Negative	0.02
39	Wall	Concrete	B	Intact	White	First	3 Bathroom	Negative	0.55
40	Wall	Concrete	C	Intact	White	First	3 Bathroom	Negative	0.05
41	Wall	Concrete	D	Intact	White	First	3 Bathroom	Negative	0.03
42	Shelves	Wood	C	Intact	White	First	3 Bathroom	Negative	0
43	Door Frame 1	Metal	A	Intact	Black	First	3 Bathroom	Negative	0.07
44	Door Frame 2	Metal	A	Intact	Black	First	3 Bathroom	Negative	0.01
45	Wall	Concrete	A	Intact	White	First	6	Negative	0.01
46	Wall	Concrete	B	Intact	White	First	6	Negative	0.01
47	Wall	Concrete	C	Intact	White	First	6	Negative	0.02
48	Wall	Concrete	D	Intact	White	First	6	Negative	0.01
49	Exit Door	Wood	C	Intact	Red	First	6	Negative	0.24
50	Exit Door Frame	Metal	C	Intact	Red	First	6	Negative	0.18
51	Bathroom Door Frame	Wood	A	De	White	First	6	Negative	0.12
52	Closet Door Frame	Wood	B	Intact	White	First	6	Negative	0.01
53	Entry Door Frame	Metal	A	Intact	White	First	6	Negative	0.01
54	Window Casing	Metal	C	Intact	White	First	6	Negative	0.08
55	Wall	Concrete	A	Intact	White	First	8	Negative	0.02
56	Wall	Concrete	B	Intact	White	First	8	Negative	0.01
57	Wall	Concrete	C	Intact	White	First	8	Negative	0.02
58	Wall	Concrete	D	Intact	White	First	8	Negative	0.02
59	Exit Door	Concrete	C	Intact	Red	First	8	Negative	0.14
60	Exit Door Frame	Metal	C	Intact	Red	First	8	Negative	0.18
61	Window Trim	Metal	C	Intact	White	First	8	Negative	0.15
62	Bathroom Door Frame	Metal	A	De	White	First	8	Negative	0.01
63	Entry Door Frame	Metal	A	De	White	First	8	Negative	0.02
64	Entry Door Vent	Metal	A	De	White	First	8	Negative	0
65	Closet Door Frame	Wood	D	De	White	First	8	Negative	0.01
66	Wall	Concrete	A	Intact	White	First	Shared Bathroom	Negative	0.03
67	Wall	Concrete	B	Intact	White	First	Shared Bathroom	Negative	0.05
68	Wall	Concrete	C	Intact	White	First	Shared Bathroom	Negative	0.02
69	Wall	Concrete	D	Intact	White	First	Shared Bathroom	Negative	0.02
70	Door Frame 1	Wood	C	Intact	White	First	Shared Bathroom	Negative	0.01
71	Door Frame 1	Metal	C	Intact	White	First	Shared Bathroom	Negative	0.04
72	Wall	Concrete	A	Intact	White	First	84 Gym	Negative	0
73	Wall	Concrete	B	Intact	White	First	84 Gym	Negative	0
74	Wall	Concrete	C	Intact	Red	First	84 Gym	Negative	0
75	Wall	Concrete	D	Intact	White	First	84 Gym	Negative	0

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
76	Entry Door Frame 1	Metal	A	Intact	Red	First	84 Gym	Negative	0.03
77	Entry Door Frame 2	Metal	A	Intact	Red	First	84 Gym	Negative	0.02
78	Storage Door Frame	Metal	B	Intact	Red	First	84 Gym	Negative	0.01
79	Stage Door Frame	Metal	C	De	Red	First	84 Gym	Negative	0.06
80	Hallway Door Frame	Metal	C	De	Red	First	84 Gym	Negative	0.02
81	Exit Door	Metal	D	Intact	Red	First	84 Gym	Negative	0.5
82	Exit Door Frame	Metal	D	Intact	Red	First	84 Gym	Negative	0.01
83	Window Casing	Metal	D	Intact	Red	First	84 Gym	Negative	0.03
84	Louver	Metal	A	Intact	White	First	84 Gym	Negative	0
85	Wall	Concrete	A	Intact	White	First	82 Gym Stage	Negative	0.01
86	Wall	Concrete	B	Intact	White	First	82 Gym Stage	Negative	0.08
87	Wall	Concrete	C	Intact	White	First	82 Gym Stage	Negative	0.02
88	Wall	Concrete	D	Intact	White	First	82 Gym Stage	Negative	0.02
89	Door Frame	Metal	B	Intact	Red	First	82 Gym Stage	Negative	0.22
90	Door Frame 2	Metal	B	Intact	Red	First	82 Gym Stage	Negative	0.07
91	Wall	Concrete	A	Intact	White	First	87	Negative	0.01
92	Wall	Concrete	B	Intact	White	First	87	Negative	0.01
93	Wall	Concrete	C	Intact	White	First	87	Negative	0
94	Wall	Concrete	D	Intact	White	First	87	Negative	0.01
95	Baseboard	Vinyl	B	Intact	Tan	First	87	Negative	0.02
96	Exit Door	Wood	A	Intact	Red	First	87	Negative	0.08
97	Exit Door Frame	Metal	A	Intact	Red	First	87	Negative	0.01
98	Window Trim	Metal	A	Intact	White	First	87	Negative	0
99	Bathroom Door Frame	Metal	C	De	White	First	87	Negative	0.06
100	Room 88 Door Frame	Metal	C	De	White	First	87	Negative	0.01
101	Entry Door Frame	Metal	C	Intact	White	First	87	Negative	0.01
102	Storage Door Frame	Metal	D	Intact	White	First	87	Negative	0.02
103	Room 86 Door Frame	Metal	D	De	White	First	87	Negative	0.01
104	Louver	Metal	D	De	White	First	87	Negative	0
105	Wall	Concrete	A	Intact	White	First	87 Bathroom	Negative	0.09
106	Wall	Concrete	B	Intact	White	First	87 Bathroom	Negative	0.06
107	Wall	Concrete	C	Intact	White	First	87 Bathroom	Negative	0.04
108	Wall	Concrete	D	Intact	White	First	87 Bathroom	Negative	0.02
109	Door Frame	Metal	A	De	White	First	87 Bathroom	Negative	0
110	Wall	Concrete	A	Intact	White	First	73 Cafeteria	Negative	0
111	Wall	Concrete	B	Intact	White	First	73 Cafeteria	Negative	0
112	Wall	Concrete	C	Intact	White	First	73 Cafeteria	Negative	0

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
113	Wall	Concrete	D	Intact	White	First	73 Cafeteria	Negative	0.03
114	Hallway Door	Wood	B	Intact	Red	First	73 Cafeteria	Negative	0.19
115	Hallway Door Frame	Wood	B	De	Red	First	73 Cafeteria	Negative	0.15
116	Exit Door	Wood	C	Peeling	Red	First	73 Cafeteria	Negative	0.22
117	Exit Door Frame	Metal	C	Intact	Red	First	73 Cafeteria	Negative	0.04
118	Fire Ext Cabinet	Metal	D	Intact	Red	First	73 Cafeteria	Negative	0.02
119	Hallway Door	Wood	D	Intact	Red	First	73 Cafeteria	Negative	0.21
120	Hallway Door Frame	Metal	D	Intact	Red	First	73 Cafeteria	Negative	0.15
121	Vent	Metal	D	Intact	White	First	73 Cafeteria	Negative	0
122	Hallway Door Frame	Metal	A	Intact	White	First	73 Cafeteria	Negative	0.16
123	Window Trim	Metal	A	Intact	White	First	73 Cafeteria	Negative	0.06
124	Kitchen Door Frame 1	Metal	B	Intact	White	First	73 Cafeteria	Negative	0.01
125	Kitchen Door Frame 2	Metal	B	Intact	White	First	73 Cafeteria	Negative	0.01
126	Kitchen Door Frame 3	Metal	B	Intact	White	First	73 Cafeteria	Negative	0.02
127	Girl Rr Door Frame	Metal	D	Intact	White	First	73 Cafeteria	Negative	0.02
128	Custodian Door Frame	Metal	D	Intact	White	First	73 Cafeteria	Negative	0.05
129	Boy Rr Door Frame	Metal	D	Intact	White	First	73 Cafeteria	Negative	0.01
130	Wall	Concrete	A	Intact	White	First	Cafeteria Boy Rr	Negative	0.06
131	Wall	Concrete	B	Intact	White	First	Cafeteria Boy Rr	Negative	0.03
132	Wall	Concrete	C	Intact	White	First	Cafeteria Boy Rr	Negative	0.05
133	Wall	Concrete	D	Intact	White	First	Cafeteria Boy Rr	Negative	0.06
134	Radiator	Metal	A	Intact	White	First	Cafeteria Boy Rr	Negative	0.01
135	Door Frame	Metal	B	Intact	White	First	Cafeteria Boy Rr	Negative	0.04
136	Wall	Metal	B	Intact	White	First	Cafeteria Girl Rr	Negative	0.04
137	Wall	Concrete	B	Intact	White	First	Cafeteria Girl Rr	Negative	0.02
138	Wall	Concrete	C	Intact	White	First	Cafeteria Girl Rr	Negative	0.04
139	Wall	Concrete	D	Intact	White	First	Cafeteria Girl Rr	Negative	0.61
140	Radiator	Concrete	C	Intact	White	First	Cafeteria Girl Rr	Negative	0.01
141	Door Frame	Metal	B	Intact	White	First	Cafeteria Girl Rr	Negative	0.16
142	Wall	Concrete	A	Intact	Light Blue	First	10	Negative	0.03
143	Wall	Drywall	B	De	White	First	10	Negative	0
144	Wall	Concrete	C	Intact	White	First	10	Negative	0.05
145	Window Trim	Wood	A	De	White	First	10	Negative	0.14
146	Panel	Wood	B	De	White	First	10	Negative	0
147	Closet Door Frame	Metal	B	Intact	White	First	10	Negative	0.26
148	Entry Door Frame	Metal	C	Intact	White	First	10	Negative	0.15

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
149	Bathroom Door Frame	Metal	C	De	White	First	10	Negative	0.12
150	Wall	Concrete	A	Intact	White	First	10 Shared Bathroom	Negative	0.01
151	Wall	Concrete	B	Intact	White	First	10 Shared Bathroom	Negative	0
152	Wall	Concrete	C	Intact	White	First	10 Shared Bathroom	Negative	0.07
153	Wall	Concrete	D	Intact	White	First	10 Shared Bathroom	Negative	0.02
154	Door Frame 1	Metal	A	De	White	First	10 Shared Bathroom	Negative	0.05
155	Door Frame 2	Metal	A	De	White	First	10 Shared Bathroom	Negative	0.15
156	Wall	Concrete	A	Intact	White	First	13	Negative	0.02
157	Wall	Concrete	B	Intact	White	First	13	Negative	0
158	Wall	Concrete	C	Intact	White	First	13	Negative	0.03
159	Wall	Concrete	D	Intact	White	First	13	Negative	0.01
160	Exit Door	Wood	C	Intact	Red	First	13	Negative	0.18
161	Exit Door Frame	Metal	C	Intact	Red	First	13	Negative	0.1
162	Bathroom Door Frame	Metal	A	De	White	First	13	Negative	0.2
163	Entry Door Frame	Metal	A	De	White	First	13	Negative	0.4
164	Closet Door Frame	Metal	D	De	White	First	13	Negative	0.18
165	Wall	Concrete	A	Intact	White	First	13 Shared Bathroom	Negative	0.04
166	Wall	Concrete	B	Intact	White	First	13 Shared Bathroom	Negative	0.04
167	Wall	Concrete	C	Intact	White	First	13 Shared Bathroom	Negative	0.05
168	Wall	Concrete	D	Intact	White	First	13 Shared Bathroom	Negative	0.02
169	Door Frame 1	Metal	C	Intact	White	First	13 Shared Bathroom	Negative	0.11
170	Door Frame 2	Metal	C	Intact	White	First	13 Shared Bathroom	Negative	0.22
171	Wall	Concrete	A	Intact	White	First	14	Negative	0.01
172	Wall	Concrete	B	Intact	White	First	14	Negative	0.02
173	Wall	Concrete	C	Intact	White	First	14	Negative	0.02
174	Wall	Concrete	D	Intact	White	First	14	Negative	0.01
175	Exit Door	Wood	A	Intact	Red	First	14	Negative	0.26
176	Exit Door Frame	Metal	A	Intact	Red	First	14	Negative	0.27
177	Window Trim	Metal	A	Intact	White	First	14	Negative	0.02
178	Bathroom Door Frame	Metal	C	Intact	White	First	14	Negative	0.13
179	Entry Door Frame	Metal	C	Intact	White	First	14	Negative	0.3
180	Closet Door Frame	Metal	B	Intact	White	First	14	Negative	0.2
181	Wall	Concrete	A	Intact	White	First	14 Shared Bathroom	Negative	0.01
182	Wall	Concrete	B	Intact	White	First	14 Shared Bathroom	Negative	0.03
183	Wall	Concrete	C	Intact	White	First	14 Shared Bathroom	Negative	0.02
184	Wall	Concrete	D	Intact	White	First	14 Shared Bathroom	Negative	0.01
185	Door Frame 1	Metal	A	Intact	White	First	14 Shared Bathroom	Negative	0.28
186	Door Frame 2	Metal	A	Intact	White	First	14 Shared Bathroom	Negative	0.19

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
187	Wall	Concrete	A	Intact	White	First	17	Negative	0.02
188	Wall	Concrete	B	Intact	White	First	17	Negative	0.01
189	Wall	Concrete	C	Intact	White	First	17	Negative	0.01
190	Wall	Concrete	D	Intact	White	First	17	Negative	0.05
191	Exit Door	Wood	C	Intact	Red	First	17	Negative	0.14
192	Exit Door Frame	Metal	C	Intact	Red	First	17	Negative	0.3
193	Window Trim	Metal	C	Intact	White	First	17	Negative	0.09
194	Bathroom Door Frame	Metal	A	De	White	First	17	Negative	0.23
195	Entry Door Frame	Metal	A	De	White	First	17	Negative	0.05
196	Closet Door Frame	Metal	D	De	White	First	17	Negative	0.16
197	Wall	Concrete	A	Intact	White	First	17 Shared Bathroom	Negative	0.05
198	Wall	Concrete	B	Intact	White	First	17 Shared Bathroom	Negative	0.02
199	Wall	Concrete	C	Intact	White	First	17 Shared Bathroom	Negative	0.05
200	Wall	Concrete	D	Intact	White	First	17 Shared Bathroom	Negative	0.01
201	Door Frame 1	Metal	C	De	White	First	17 Shared Bathroom	Negative	0.24
202	Door Frame 2	Metal	C	De	White	First	17 Shared Bathroom	Negative	0.08
203	Calibration							Positive	1.2
204	Calibration							Positive	1.1
205	Calibration							Positive	1.0
206	Wall	Concrete	A	Intact	White	First	23	Negative	0.01
207	Wall	Concrete	B	Intact	White	First	23	Negative	0.03
208	Wall	Concrete	C	Intact	White	First	23	Negative	0.02
209	Wall	Concrete	D	Intact	White	First	23	Negative	0.01
210	Exit Door	Wood	B	De	Red	First	23	Negative	0.24
211	Exit Door Frame	Metal	B	Intact	Red	First	23	Negative	0.07
212	Window Trim	Wood	B	Intact	White	First	23	Negative	0.2
213	Closet Door Frame	Metal	A	Intact	White	First	23	Negative	0.21
214	Entry Door Frame	Metal	D	Intact	White	First	23	Negative	0.05
215	Bathroom Door Frame	Metal	D	Intact	White	First	23	Negative	0.08
216	Wall	Concrete	A	Intact	White	First	23 Shared Bathroom	Negative	0.06
217	Wall	Concrete	B	Intact	White	First	23 Shared Bathroom	Negative	0.06
218	Wall	Concrete	C	Intact	White	First	23 Shared Bathroom	Negative	0.03
219	Wall	Concrete	D	Intact	White	First	23 Shared Bathroom	Negative	0.06
220	Door Frame 1	Metal	B	De	White	First	23 Shared Bathroom	Negative	0.1
221	Door Frame 2	Metal	B	De	White	First	23 Shared Bathroom	Negative	0.4
222	Wall	Drywall	A	Intact	White	First	26	Negative	0.01
223	Wall	Concrete	B	Intact	White	First	26	Negative	0.38
224	Wall	Concrete	C	Intact	White	First	26	Negative	0.14

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
225	Wall	Concrete	D	Intact	White	First	26	Negative	0.06
226	Exit Door	Wood	D	De	Red	First	26	Negative	0.14
227	Exit Door Frame	Metal	D	De	Red	First	26	Negative	0.09
228	Window Trim	Wood	D	Intact	White	First	26	Negative	0.1
229	Bathroom Door Frame	Metal	B	De	White	First	26	Negative	0.12
230	Entry Door Frame	Metal	B	Intact	White	First	26	Negative	0.09
231	Closet Door Frame	Metal	C	Intact	White	First	26	Negative	0.18
232	Wall	Concrete	A	Intact	White	First	26 Shared Bathroom	Negative	0.29
233	Wall	Concrete	B	Intact	White	First	26 Shared Bathroom	Negative	0.08
234	Wall	Concrete	C	Intact	White	First	26 Shared Bathroom	Negative	0.02
235	Wall	Concrete	D	Intact	White	First	26 Shared Bathroom	Negative	0.01
236	Door Frame 1	Metal	D	De	White	First	26 Shared Bathroom	Negative	0.2
237	Door Frame 2	Metal	D	De	White	First	26 Shared Bathroom	Negative	0.06
238	Wall	Concrete	A	Intact	White	First	28	Negative	0.01
239	Wall	Concrete	B	Intact	White	First	28	Negative	0.06
240	Wall	Concrete	C	Intact	White	First	28	Negative	0.02
241	Wall	Concrete	D	Intact	White	First	28	Negative	0.01
242	Exit Door	Wood	B	De	Red	First	28	Negative	0.3
243	Exit Door Frame	Wood	B	De	Red	First	28	Negative	0.21
244	Window Trim	Wood	D	Intact	White	First	28	Negative	0.14
245	Closet Door Frame	Metal	D	De	White	First	28	Negative	0.07
246	Bathroom Door Frame	Metal	A	De	White	First	28	Negative	0.07
247	Entry Door Frame	Metal	D	Intact	White	First	28	Negative	0.3
248	Wall	Concrete	A	Intact	White	First	28 Bathroom	Negative	0.06
249	Wall	Concrete	B	Intact	White	First	28 Bathroom	Negative	0.02
250	Wall	Concrete	C	Intact	White	First	28 Bathroom	Negative	-0.37
251	Wall	Concrete	D	Intact	White	First	28 Bathroom	Negative	0.07
252	Door Frame	Metal	A	Intact	White	First	28 Bathroom	Negative	0.16
253	Door Frame	Metal	C	Intact	White	First	28 Bathroom	Negative	0.09
254	Wall	Concrete	A	Intact	White	First	29	Negative	-0.36
255	Wall	Concrete	B	Intact	White	First	29	Negative	0.05
256	Wall	Concrete	C	Intact	White	First	29	Negative	0.11
257	Wall	Concrete	D	Intact	White	First	29	Negative	0
258	Exit Door	Wood	D	Intact	Red	First	29	Negative	0.19
259	Exit Door Frame	Metal	D	Intact	Red	First	29	Negative	0.12
260	Window Trim	Wood	D	Intact	White	First	29	Negative	0.01
261	Closet Door Frame	Metal	B	De	White	First	29	Negative	0.11

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
262	Entry Door Frame	Metal	B	De	White	First	29	Negative	0.15
263	Bathroom Door Frame	Metal	B	De	White	First	29	Negative	0.06
264	Wall	Concrete	A	Intact	White	First	29 Bathroom	Negative	0.07
265	Wall	Concrete	B	Intact	White	First	29 Bathroom	Null	0.6
266	Wall	Concrete	B	Intact	White	First	29 Bathroom	Negative	0.04
267	Wall	Concrete	C	Intact	White	First	29 Bathroom	Negative	0.02
268	Wall	Concrete	D	Intact	White	First	29 Bathroom	Negative	0.14
269	Door Frame	Metal	C	Intact	White	First	29 Bathroom	Negative	0.12
270	Wall	Plaster	A	Intact	White	First	78 Home Ec	Negative	0.23
271	Wall	Drywall	B	Intact	White	First	78 Home Ec	Negative	0
272	Wall	Plaster	C	Intact	White	First	78 Home Ec	Negative	0.01
273	Wall	Drywall	D	Intact	White	First	78 Home Ec	Negative	0.01
274	Window Sash	Wood	A	Intact	White	First	78 Home Ec	Negative	0.04
275	Entry Door Frame	Miniblind	A	Intact	White	First	78 Home Ec	Negative	0.03
276	Wall	Concrete	A	Intact	White	First	42	Negative	0.02
277	Wall	Concrete	B	Intact	White	First	42	Negative	0
278	Wall	Concrete	C	De	White	First	42	Negative	0.4
279	Wall	Concrete	D	Intact	White	First	42	Negative	0.02
280	Window Trim	Wood	C	Intact	White	First	42	Negative	0
281	Door Frame	Metal	A	De	White	First	42	Negative	0.12
282	Wall	Concrete	A	Intact	White	First	39	Negative	0.01
283	Wall	Concrete	B	Intact	White	First	39	Negative	0.01
284	Wall	Concrete	C	Intact	White	First	39	Negative	0.5
285	Wall	Concrete	D	Intact	White	First	39	Negative	0.01
286	Window Trim	Wood	C	Intact	White	First	39	Negative	0.01
287	Entry Door Frame	Metal	D	Intact	White	First	39	Negative	0.01
288	Front Door	Wood	A	Intact	Red	First	Main Lobby	Negative	0.27
289	Front Door Frame	Wood	A	De	Red	First	Main Lobby	Negative	0.02
290	Courtyard Door	Wood	C	De	Red	First	Main Lobby	Negative	0
291	Courtyard Door Frame	Metal	C	De	Red	First	Main Lobby	Negative	0
292	Window Trim	Metal	A	Intact	Red	First	Main Lobby	Negative	0.02
293	Window Trim	Metal	C	Intact	Red	First	Main Lobby	Negative	0.02
294	Wall	Concrete	A	Intact	White	First	Gym Laundry Room	Negative	0.01
295	Wall	Concrete	C	Intact	White	First	Gym Laundry Room	Negative	0.01
296	Wall	Concrete	D	Intact	White	First	Gym Laundry Room	Negative	0.01
297	Floor	Concrete	Low er	De	Gray	First	Gym Laundry Room	Negative	0
298	Roof Ladder	Concrete	Low er	De	Gray	First	Gym Laundry Room	Negative	0.02
299	Wall	Concrete	A	Intact	White	First	Boiler Room	Negative	0

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
300	Wall	Concrete	B	Intact	White	First	Boiler Room	Negative	0
301	Wall	Concrete	C	Intact	White	First	Boiler Room	Negative	0
302	Wall	Concrete	D	Intact	White	First	Boiler Room	Negative	0
303	Door	Wood	A	Intact	Green	First	Boiler Room	Negative	0
304	Door Frame	Metal	A	Intact	Beige	First	Boiler Room	Negative	0
305	Natural Gas Pipe	Metal	B	Intact	Yellow	First	Boiler Room	Negative	0
306	Door Frame	Metal	D	De	White	First	Boiler Room	Negative	0.02
307	Wall	Concrete	A	Intact	White	First	Orange Hallway Adj Main Office	Negative	0.01
308	Wall	Concrete	C	Intact	White	First	Orange Hallway Adj Main Office	Negative	0
309	Chair Rail	Concrete	C	Intact	White	First	Orange Hallway Adj Main Office	Negative	0.06
310	Wall	Concrete	A	Intact	White	First	Orange Hallway Adj Rm 3	Negative	0.02
311	Wall	Concrete	C	Intact	White	First	Orange Hallway Adj Rm 3	Negative	0.03
312	Chair Rail	Concrete	C	Intact	White	First	Orange Hallway Adj Rm 3	Negative	0.01
313	Wall	Concrete	A	Intact	White	First	Orange Hallway Adj Rm 9	Negative	0
314	Wall	Concrete	C	Intact	White	First	Orange Hallway Adj Rm 9	Negative	0.02
315	Fire Ex Cabinet	Concrete	C	Intact	Red	First	Orange Hallway Adj Rm 9	Negative	0
316	Fire Ex Cabinet	Wood	D	Intact	Red	First	Orange Hallway Adj Rm 9	Negative	0.15
317	Orange Entry Door Frame	Metal	D	Intact	Red	First	Orange Hallway Adj Rm 9	Negative	0.01
318	Calibration							Positive	1.2
319	Calibration							Positive	1.1
320	Calibration							Positive	1.0
321	Wall	Concrete	A	Intact	White	First	Green Hallway Adj Rm 23	Negative	0.01
322	Wall	Concrete	B	Intact	White	First	Green Hallway Adj Rm 23	Negative	0.04
323	Wall	Concrete	D	Intact	White	First	Green Hallway Adj Rm 23	Negative	0.01
324	Fire Ext Cabinet	Metal	D	Intact	Red	First	Green Hallway Adj Rm 23	Negative	0.01
325	Rm 23 Door Frame	Metal	B	De	White	First	Green Hallway Adj Rm 23	Negative	0.05
326	Rm 24 Door Frame	Metal	D	De	White	First	Green Hallway Adj Rm 23	Negative	0.24
327	Wall	Concrete	A	Intact	White	First	Green Hallway Adj Rm 56	Negative	0
328	Wall	Concrete	B	Intact	White	First	Green Hallway Adj Rm 56	Negative	0.03
329	Wall	Concrete	C	Intact	White	First	Green Hallway Adj Rm 56	Negative	0.01
330	Exit Door	Wood	B	Intact	Red	First	Green Hallway Adj Rm 56	Negative	0.21
331	Exit Door Frame	Metal	B	Intact	Red	First	Green Hallway Adj Rm 56	Negative	0.17
332	Window Casing	Metal	B	De	Red	First	Green Hallway Adj Rm 56	Negative	0.12

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
333	Rm 56 Casing	Metal	C	De	White	First	Green Hallway Adj Rm 56	Negative	0.21
334	Wall	Concrete	B	Intact	White	First	Green Hallway Adj Rm 32	Negative	0.02
335	Wall	Concrete	C	Intact	White	First	Green Hallway Adj Rm 32	Negative	0.01
336	Wall	Concrete	D	Intact	White	First	Green Hallway Adj Rm 32	Negative	0.01
337	Rm 32 Door Frame	Metal	B	Intact	White	First	Green Hallway Adj Rm 32	Negative	0.24
338	Exit Door	Wood	C	Intact	Red	First	Green Hallway Adj Rm 32	Negative	0.4
339	Exit Door Frame	Metal	C	Intact	Red	First	Green Hallway Adj Rm 32	Negative	0.24
340	Fire Ext Cabinet	Metal	D	Intact	Red	First	Green Hallway Adj Rm 32	Negative	0
341	Wall	Concrete	B	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0
342	Wall	Concrete	C	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0
343	Wall	Concrete	D	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0.02
344	Exit Door	Wood	C	Intact	Red	First	Blue Hallway Adj Rm 78	Negative	0.29
345	Exit Door Frame	Wood	C	Intact	Red	First	Blue Hallway Adj Rm 78	Negative	0.06
346	Rm 78 Window Trim	Wood	D	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0.02
347	Rm 78 Window Sash	Wood	D	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0.01
348	Rm 78 Lintel	Wood	D	Intact	White	First	Blue Hallway Adj Rm 78	Negative	0.04
349	Calibration							Positive	1.2
350	Calibration							Positive	1.1
351	Calibration							Positive	1.0
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352	Calibration							Positive	1.0
353	Calibration							Positive	1.1
354	Calibration							Positive	1.2
355	Beam	Concrete	Upper	Intact	Red	First	Gym Storage	Negative	0.03
356	Wall	Concrete	A	Intact	White	First	Pool	Negative	0.49
357	Wall	Concrete	B	Intact	White	First	Pool	Negative	0.33
358	Wall	Concrete	C	Intact	White	First	Pool	Negative	0.02
359	Wall	Concrete	D	Intact	White	First	Pool	Negative	0.03
360	Wall	Ceramic	A	Intact	Light Blue	First	Pool	Negative	0.4
361	Wall	Ceramic	B	Intact	Light Blue	First	Pool	Negative	0.4
362	Wall	Ceramic	C	Intact	Light Blue	First	Pool	Negative	0.3
363	Wall	Ceramic	D	Intact	Light Blue	First	Pool	Negative	0.4
364	Wall	Ceramic	D	Intact	Light Blue	First	Pool	Negative	0
365	Floor	Concrete	Lower	Intact	Red	First	Laundry	Negative	0
366	Baseboard	Ceramic	A	Intact	Green	First	Girl Rr	Negative	0.4

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
367	Floor	Ceramic	Lower	Intact	Green	First	Girl Rr	Negative	0
368	Wall	Concrete	A	Intact	White	First	71 Kitchen	Negative	0.01
369	Wall	Concrete	B	Intact	White	First	71 Kitchen	Negative	0.03
370	Wall	Concrete	C	Intact	White	First	71 Kitchen	Negative	0.29
371	Wall	Concrete	D	Intact	White	First	71 Kitchen	Negative	0.03
372	Wall	Concrete	D	Intact	Red	First	71 Kitchen	Negative	0.05
373	Rm 72 Door Frame	Metal	A	De	White	First	71 Kitchen	Negative	0.14
374	Storage Rm Doot Frame	Metal	B	De	White	First	71 Kitchen	Negative	0.1
375	Hallway Door Frame	Metal	B	De	White	First	71 Kitchen	Negative	0.06
376	Door Frame 1	Metal	D	De	White	First	71 Kitchen	Negative	0.15
377	Door Frame 2	Metal	D	De	White	First	71 Kitchen	Negative	0.01
378	Door Frame 3	Metal	D	De	White	First	71 Kitchen	Negative	0.21
379	Wall	Concrete	A	Intact	White	First	Yellow Hallway Adj Rm 20	Negative	0.02
380	Wall	Concrete	C	Intact	White	First	Yellow Hallway Adj Rm 20	Negative	0.03
381	Rm 18 Door Frame	Metal	C	Intact	White	First	Yellow Hallway Adj Rm 20	Negative	0.01
382	Window Trim	Metal	C	Intact	White	First	Yellow Hallway Adj Rm 20	Negative	0.01
383	Exit Door	Metal	C	Intact	Red	First	Yellow Hallway Adj Rm 20	Negative	0.29
384	Exit Door Frame	Metal	C	Intact	Red	First	Yellow Hallway Adj Rm 20	Negative	0.04
385	Wall	Concrete	A	Intact	White	First	Yellow Hallway Adj Rm 11	Negative	0.02
386	Wall	Concrete	C	Intact	White	First	Yellow Hallway Adj Rm 11	Negative	0
387	Door	Wood	B	Intact	Red	First	Yellow Hallway Adj Rm 11	Negative	0.02
388	Door Frame	Metal	B	Intact	Red	First	Yellow Hallway Adj Rm 11	Negative	0.03
389	Exit Door	Wood	D	Intact	Red	First	Yellow Hallway Adj Rm 16	Negative	0.13
390	Exit Door Frame	Metal	D	Intact	Red	First	Yellow Hallway Adj Rm 16	Negative	0.02
391	Fire Ext Cabinet	Metal	C	Intact	Red	First	Yellow Hallway Adj Rm 16	Negative	0.02
392	Door 1	Wood	A	Intact	Brown	Exterior	Front Of School	Negative	0.2
393	Door 1 Frame	Metal	A	Intact	Beige	Exterior	Front Of School	Negative	0.12
394	Railing	Metal	A	Intact	Yellow	Exterior	Front Of School	Negative	0
395	Window Trim	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.25
396	Window Trim 2	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.03
397	Window Trim 3	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.03
398	Window Trim 4	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.03
399	Window Trim 5	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.11
400	Window Trim 6	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.03
401	Window Trim 7	Wood	A	Intact	Beige	Exterior	Front Of School	Negative	0.03

XRF Reading	Component	Substrate	Side	Condition	Color	Floor	Room	Results	Lead (Mg/Cm²)
402	Door 2	Wood	B	Intact	Brown	Exterior	Front Of School	Negative	0.08
403	Door 2 Frame	Metal	B	Intact	Beige	Exterior	Front Of School	Negative	0.18
404	Window Trim	Wood	B	Intact	Beige	Exterior	Front Of School	Negative	0.05
405	Door 3	Wood	B	Intact	Brown	Exterior	Front Of School	Negative	0.26
406	Door 3 Frame	Metal	B	Intact	Beige	Exterior	Front Of School	Negative	0.14
407	Window Trim 2	Wood	B	Intact	Beige	Exterior	Front Of School	Negative	0.14
408	Door 4	Wood	B	Intact	Brown	Exterior	Courtyard	Negative	0.15
409	Door 4 Frame	Metal	B	Intact	Beige	Exterior	Courtyard	Negative	0.07
410	Window Trim	Metal	B	Intact	Beige	Exterior	Courtyard	Negative	0.22
411	Door 5	Wood	B	Intact	Brown	Exterior	Courtyard	Negative	0.13
412	Door 5 Frame	Metal	B	Intact	Beige	Exterior	Courtyard	Negative	0.13
413	Door 6	Wood	B	Intact	Brown	Exterior	Courtyard	Negative	0.26
414	Door 6 Frame	Metal	B	Intact	Beige	Exterior	Courtyard	Negative	0.1
415	Window Trim 1	Wood	B	Intact	Beige	Exterior	Courtyard	Negative	0.1
416	Window Trim 2	Wood	B	Intact	Beige	Exterior	Courtyard	Negative	0.21
417	Window Trim 3	Wood	B	Intact	Beige	Exterior	Courtyard	Negative	0.11
418	Window Trim 4	Wood	B	Intact	Beige	Exterior	Courtyard	Negative	0.16
419	Door 7	Wood	C	Intact	Brown	Exterior	Playground	Negative	0.16
420	Door 7 Frame	Metal	C	Intact	Beige	Exterior	Playground	Negative	0.05
421	Door 8	Wood	C	Intact	Brown	Exterior	Playground	Negative	0.2
422	Door 8 Frame	Metal	C	Intact	Beige	Exterior	Playground	Negative	0.02
423	Window Trim 1	Wood	C	Intact	Beige	Exterior	Playground	Negative	0.01
424	Window Trim 2	Wood	C	Intact	Beige	Exterior	Playground	Negative	0.02
425	Window Trim 3	Wood	C	Intact	Beige	Exterior	Playground	Negative	0.01
426	Door 9	Wood	D	Intact	Brown	Exterior	Field And Basketball Court	Negative	0.27
427	Door 9 Frame	Metal	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.01
428	Door 10	Wood	D	Intact	Brown	Exterior	Field And Basketball Court	Negative	0.3
429	Door 10 Frame	Metal	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.02
430	Window Trim 1	Wood	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.02
431	Window Trim 2	Wood	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.01
432	Window Trim 3	Wood	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.11
433	Window Trim 4	Wood	D	Intact	Beige	Exterior	Field And Basketball Court	Negative	0.04
434	Calibration							Positive	1.2
435	Calibration							Positive	1.1
436	Calibration							Positive	1.0

Demolition Hazardous Materials Survey

**Waverley Elementary School
201 Waverley Drive
Frederick, MD 21702**

Prepared for

**Frederick County Public Schools
191 South East Street
Frederick, MD 21701**

January 18, 2019

Prepared by





10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
OFFICE: (410) 480-3636
FAX (410) 480-3637

January 18, 2019

Mr. Brian Staiger
Senior Project Manager
Construction Management
Frederick County Public Schools
191 South East Street
Frederick, MD 21701-5918

Re: Demolition Hazardous Materials Survey
Waverley Elementary School
201 Waverley Drive
Frederick, MD 21702

Dear Mr. Staiger,

AERO EH&S, Inc. (AERO) is pleased to submit the attached Hazardous Materials Survey report for the referenced site. The survey was performed from August 7 through 15, 2018 with additional site visits concluding January 4, 2019. The survey included all accessible portions of the building. This report includes the procedures and methods for the survey along with test results.

As a result of the survey, asbestos-containing materials, lead-based paint, lead-containing paint and materials, mercury-containing light tubes, and the presence of Freon-containing equipment were identified. AERO has provided conclusions and/or recommendations regarding these materials within the report.


AERO appreciates the opportunity to perform this Demolition Hazardous Materials Survey for Frederick County Public Schools. Please contact our office if you have any questions.

Sincerely,

AERO EH&S, Inc.



S. Michael Derdeyn
Senior Project Manager



Michael J. Hentgen, CIH CSP
President

Demolition Hazardous Materials Survey

Waverley Elementary School
201 Waverley Drive
Frederick, MD

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APPENDIX A	Waverley ES Room Number Drawings
APPENDIX B	Bulk Asbestos Lab Report
APPENDIX C	Room by Room ACM Inventory (AHERA)
APPENDIX D	ACM Material Location Drawings
APPENDIX E	XRF Readings Spreadsheet
APPENDIX F	XRF Reading Location Drawing
APPENDIX G	Freon®-Containing Equipment Locations

Demolition Hazardous Materials Survey

Waverley Elementary School
201 Waverley Drive
Frederick, MD

Purpose and Scope of Service

The purpose of this project was to conduct a Demolition Hazardous Material Survey of Waverley Elementary School ("Site"), located at 201 Waverley Drive, Frederick, Maryland. The proposed scope of work was to identify materials that need to be removed prior to the anticipated demolition of Waverley Elementary School. Drawings of Waverley Elementary School with associated room numbers used for this report are included in **Appendix A**. The survey was performed in accordance with the following scope of work.

Asbestos-Containing Materials Survey

- (1) Licensed asbestos inspectors conducted a survey of interior and exterior building materials suspected to contain asbestos. The survey was conducted in accordance with Occupational Safety and Health Administration (OSHA) requirements and Environmental Protection Agency (EPA) AHERA guidelines for the locations and number of samples to be collected. The survey included a visual inspection of interior and exterior materials, a review of construction documents and any previous reports prepared by AERO and as made available by the Client or on-site personnel, and sampling and analysis of suspect materials to identify the presence of asbestos.
- (2) AERO conducted limited destructive testing to access otherwise inaccessible materials. Based on those findings, AERO made assumptions regarding the presence and extent of ACM suspected to be present in other similar inaccessible locations (e.g., pipe chases, plaster soffits, inside or associated with operating mechanical equipment, etc.).

AERO collected samples of suspect exterior damp proofing materials from representative locations where observed.

- (3) AERO temporarily repaired interior areas from which friable samples were collected by either using a filler compound, spraying with an acrylic clear paint, or by covering with duct tape where appropriate. Interior non-friable sample locations were not repaired.
- (4) Licensed asbestos inspectors conducted a survey of roofing materials suspected to contain asbestos that may be impacted by the demolition of the structure. AERO

repaired roof sample cores using foam cores, webbing, and non-asbestos-containing roofing cement. All sample locations were spray-marked after repair.

- (5) AERO collected bulk samples from each homogeneous area in accordance with OSHA and EPA guidelines. Three samples of thermal system insulation, three to seven samples of surfacing material, and at least two samples of each miscellaneous material are required. Since this survey was being conducted for demolition purposes, the inspectors could at their discretion collect more than two samples of each suspect miscellaneous material.
- (6) The samples were analyzed for asbestos fiber content at a laboratory accredited under the National Voluntary Laboratory Accreditation Program. The samples were analyzed by polarized light microscopy (PLM) using EPA Methods 600/M4-82-020 and/or 600/R-93/116.
- (7) Based upon the analytical results and review of drawings and blueprints made available by FCPS or on-site personnel, the approximate amounts, types, locations, and conditions of accessible ACM were determined. AERO reported on any ACM that was suspected of penetrating into inaccessible areas.

Repair of Damage to Structure

Other than sealing sampling locations as described above, AERO was not responsible for repairing any damage to the building related directly or indirectly to AERO's inspections. These repairs included but were not limited to

-) Repair of architectural finishes (e.g., floor tile, carpeting, plaster, etc.)
-) Reattaching chalkboards, tack boards, and marker boards
-) Repair of membrane roofing
-) Masonry, terrazzo, and concrete repair
-) Replacing or repairing glazing, sealants, and adhesives
-) Repairing countertops

Lead Paint Screening Survey

- (1) A Certified State of Maryland/EPA Lead Risk Assessor trained in sampling protocols and use of an X-ray Fluorescence Analyzer (XRF) conducted representative testing of painted surfaces within the building.
- (2) Use of the XRF instrument was in general accordance with the Performance Characteristic Sheet (PCS) methodology for the Heuresis Pb 200i dated December 1, 2015. XRF instrument calibration checks were performed according to the PCS. The PCS is provided as supplemental guidance to the US Housing and Urban Development (HUD) *'Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing'* and is a joint product of HUD and EPA.
- (3) As requested by FCPS, AERO also attempted to determine the lead content of other non-painted items by XRF, such as ceramic tiles, terrazzo flooring, bricks, glazed masonry blocks, etc. Plumbing fixtures could not be tested by XRF.
- (4) AERO did not collect Toxicity Characteristic Leaching Procedure (TCLP) samples for lead at the time of this survey. AERO provided a unit cost for TCLP (lead only) in our proposal.
- (5) Testing locations were identified by substrate type, component, and color.

PCB Light Ballast Survey

AERO conducted a visual survey for accessible PCB-containing light ballasts in accordance with generally accepted industry practices and EPA guidelines. The survey included a visual inspection of representative light ballasts and a review of construction documents and any previous reports as made available by FCPS or on-site personnel. Light ballasts were inspected for "No PCBs" markings. Ballasts that were free of markings or missing labels were assumed to contain PCBs.

Mercury-Containing Fixtures Survey

AERO conducted a visual survey for accessible mercury-containing switches in accordance with generally accepted industry practices and EPA guidelines. The survey included a visual inspection of representative switches and a review of construction documents and any previous reports as made available by FCPS or on-site personnel. All fluorescent light tubes were assumed to contain mercury.

Other Hazardous Materials

AERO inspected the Site for chemical storage, non-ballast sources of PCBs, and equipment that may contain Freon®. Evidence of other sources of PCBs includes, but is not necessarily limited to, transformers, capacitors, and hydraulically operated equipment. Evidence of sources of Freon® includes, but is not necessarily limited to, refrigeration and cooling equipment.

Survey Results

Asbestos-Containing Materials Survey

During the demolition survey, AERO identified the following suspect asbestos-containing materials.

-) Black Damp-Proofing on Exterior Foundation
-) Asbestos-Cement Soffit Panels
-) Built-up Roof Field
-) Sealant on Metal Flashing (Black and White)
-) Curb Flashing with Silver Paint
-) Roof Shingles (Brown and Red/Brown)
-) White Roll Flashing
-) Roll Roofing Used as Patch
-) Chalkboard Adhesive (ASSUMED)
-) Wood Clad Fire Doors (ASSUMED)

AERO collected 16 additional bulk samples of suspect asbestos-containing materials, resulting in 16 analyses.

The samples were analyzed by Scientific Analytical Institute (SAI) of Greensboro, NC using polarized light microscopy (PLM) in accordance with EPA Method 600/R-93/116 "Asbestos Analysis of Bulk Materials". SAI participates in the National Voluntary Laboratory Accreditation Program, a quality assurance program for polarized light microscopy (NVLAP Lab Code #200664-0) and is accredited by the National Institute of Standards and Technology (NIST).

The enclosed bulk sample logs and laboratory reports (**Appendix B**) contain a listing of all analyzed samples, sampling locations, and analytical results from both the AHERA performed in 2009 and the demolition survey. Results are reported in percent asbestos by volume and indicate the type(s) of asbestos. Other common non-asbestos components may also be noted on the analytical reports.

Table 1 summarizes the identified asbestos-containing materials in Waverley Elementary School. The table includes data from the previous AHERA sampling performed at the school. It also includes quantities for additional materials not accounted for in AHERA surveys with additional quantities for materials assumed to be present in inaccessible locations such as enclosed in bulkheads, inside chases, and enclosed in concrete floors.

Table 1: Identified Asbestos-Containing Materials Summary

Sample Description	Location	Approximate Quantity	Friable	Condition	Asbestos, %
9" x 9" White Floor Tile and Mastic	Room A-4	150 SF	No	Good	<u>Tile</u> 4% Chrysotile <u>Mastic</u> 6% Chrysotile
3"–6" Mudded Pipe Fitting Insulation	Observed During AHERA Surveys	55 EA	Yes	Good	5% Amosite
6"–12" Mudded Pipe Fitting Insulation	Observed During AHERA Surveys	18 EA	Yes	Good	5% Amosite
Black/Cream Seam Mastic on F/G Pipe Insulation	Observed During AHERA Surveys	820 LF	No	Good	6% Chrysotile
Black Mastic on Foil Duct Insulation	Observed During AHERA Surveys	1,490 LF	No	Good	5% Chrysotile
Asbestos Cement Soffit Panels	(See Drawings)	3,200 SF	No	Good	12% Chrysotile
Chalkboard Adhesive	Classrooms (See Drawings)	136 SF	No	Good	ASSUMED
Wood Clad Fire Doors (labeled)	(See Drawings)	13 EA	No	Good	ASSUMED

LF = linear feet
SF = square feet

A Room-by-Room Inventory of the asbestos-containing materials identified during the AHERA surveys is included in **Appendix C**. Drawings depicting the approximate locations of the identified asbestos-containing materials are included in **Appendix D**.

Lead Paint Screening Survey

Eighty-nine (89) surfaces, excluding calibration checks, were tested with the XRF. Of the 89 readings, twelve (12) indicated a presence of lead in excess of 0.7 mg/cm². The following representative building components were tested for lead:

- | | |
|---------------------------|------------------------|
|) Metal Door Jambs |) Metal Doors |
|) Asbestos-Cement Soffits |) Metal Window Casings |
|) Metal Handrails |) Metal Bike Rack |
|) Metal Fences |) Concrete Walls |

- | | |
|------------------------------|------------------------------------|
|) Concrete Wall Blocks |) Metal Overhead Doors |
|) Metal Lintels |) Metal Gas Piping |
|) Metal Transformer |) Metal Loading Dock Edge Band |
|) Metal Conduits |) Metal Junction Boxes |
|) Metal Fan Coil Units |) Metal Air Compressor |
|) Metal Chiller |) Metal Tanks |
|) Metal Piping |) Metal Valves |
|) Metal Pump Motors |) Metal Pumps |
|) Metal MCC 1 |) Metal Electrical Panels |
|) Brick Walls |) Concrete Floors |
|) Metal Boilers |) Metal Furnace Blowers |
|) Metal Columns |) Metal Control Panels |
|) Concrete Glazed Blocks |) Ceramic Floor Tiles |
|) Wood Shelves |) Metal Freezer/Refrigerator Doors |
|) Drywall Walls and Ceilings |) Wood Floors |
|) Wood Railings |) Metal "Porch Lift" |
|) Wood Cabinets |) Wood Crown Molding |
|) Wood Beams |) Wood Doors |
|) Metal Radiators | |

XRF testing revealed lead concentrations greater than or equal to 0.7 mg/cm² for the following surfaces tested:

- | | |
|--|------------------------------------|
|) Metal Handrails, Interior & Exterior |) Metal Loading Dock Edge Band |
|) Concrete Glazed Blocks, Yellow |) Concrete Glazed Blocks, Speckled |

XRF testing revealed lead concentrations less than 0.7 mg/cm², but greater than the limit of detection for the instrument used, on the following surfaces:

- | | |
|------------------------|---------------------------------|
|) Metal Door Jambs |) Metal Doors |
|) Concrete Wall Blocks |) Metal Pumps |
|) Metal Lintels |) Concrete Floors |
|) Metal Conduits |) Ceramic Floor Tiles |
|) Metal Chiller |) Metal Boilers |
|) Metal Pump Motors |) Concrete Glazed Blocks, White |

The remaining XRF tests revealed lead concentrations less than the limit of detection for the instrument used.

Appendix E contains a spreadsheet with all data obtained from the XRF testing, including XRF values and a POS (positive) or NEG (negative) classification with respect to the threshold for lead-based paint for each reading. All POS values are indicated in **boldface** in the spreadsheet. A drawing depicting the approximate reading locations is included in **Appendix F**.

State of Maryland regulations define a lead-based paint as any paint or other surface coating containing lead or lead in its compounds in any quantity greater than 0.50% lead by weight or more than 0.7 milligram per square centimeter (mg/cm²). Federal regulations define a lead-based paint as any paint or other surface coating containing lead or lead in its compounds in any quantity greater than 0.50% lead by weight, or more than 1.0 mg/cm². The Occupational Safety and Health Administration (OSHA) regulates lead present in the workplace in any concentration.

The OSHA Standard requires an employer to ensure that no employee is exposed to lead at concentrations greater than 50 micrograms of lead per cubic meter of air (µg/M³) averaged over an eight-hour period. The Standard further requires the employer to make a determination of its employees' potential exposure to lead. The Standard details presumed exposure levels for various construction activities. The employer must provide adequate personal and respiratory protection to match the presumed exposure listed in the Standard. Deviation from the presumed exposure is typically achieved by performing personal monitoring during various representative construction activities. The level of personal and respiratory protection can then be modified based upon the results of the monitoring.

TCLP – Lead Testing

AERO did not collect representative TCLP samples at the time of this survey. Due to the variety of materials found to be coated with lead-based paint or other coatings (e.g. wood, glazed ceramics, etc.), a representative waste stream could not be determined at the time of the survey. Metal components are excluded from TCLP testing because they will be recycled and not placed in a landfill.

PCB Light Ballast Survey

AERO inspected representative light fixtures within the building for suspect PCB ballasts. Metal casings covering the ballasts within the fixtures were removed, and the labels of the ballasts were inspected for “No-PCB” markings. All light fixtures inspected were found to have “no PCB” markings on their labels.

Mercury-Containing Fixtures Survey

AERO visually inspected the building for suspect mercury-containing fluorescent light tubes and fixtures. AERO identified approximately one thousand five hundred and ninety-eight (1,598) light tubes and lamps.

Other Hazardous Materials

Non-Ballast Sources of PCBs

A transformer was observed during the survey near the exterior boiler room entrance. This transformer is the property of Potomac Edison.

Freon®-Containing Equipment

AERO observed the following Freon®-containing equipment:

-) Soft drink machines
-) Water fountains
-) Personal use refrigerators
-) Ice makers
-) Refrigerated kitchen storage/display appliances
-) Walk-in refrigerators/freezers

A drawing depicting the general locations of observed Freon®-containing equipment is included in **Appendix G**.

Underground Storage Tank

AERO verified that a 10,000-gallon heating oil tank is located underground on the east side of the building.

Chemicals and Chemical Storage

Several classrooms and storage areas contained potentially hazardous products. These materials included, but were not limited to, art and office supplies and commercial cleaning products. There were no laboratory chemicals or compounds observed during the survey.

Other Hazardous Materials

Based on research of the original drawings, creosote-coated wood planks were used in trenches to cover underground utilities.

Conclusions and Recommendations

The following conclusions and recommendations are based upon the work conducted for this survey and AERO's understanding of the project.

- (1) Friable ACM was previously identified within the school in the form of pipe fitting insulation. The Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and the State of Maryland regulate friable

asbestos-containing materials. All friable asbestos-containing materials must be removed by a licensed asbestos abatement contractor and disposed of as a regulated waste prior to renovation activities that will disturb these materials, or prior to demolition of the structure.

The mudded pipe fitting insulations were present above ceiling height in mechanical spaces and observed to be in good condition. Estimated quantities for the pipe fitting insulation were determined from both field observations and using drawings provided by FCPS. It is assumed that additional quantities of these materials are present inside chase walls and plenums, and encased in concrete floors. The estimated quantities have been adjusted to reflect their potential presence.

- (2) The EPA classifies non-friable mastic associated with both fiberglass pipe and duct insulations, soffit panels, wood and metal clad fire doors, and chalk board adhesive as Category II non-friable materials. These materials must be removed by a licensed abatement contractor and disposed of as a regulated waste prior to demolition.
 -) The mastics on fiberglass pipe and duct insulation were determined to contain asbestos. These materials were observed to have been applied on the seams and end caps associated with the fiberglass pipe and duct insulation. These materials were observed to be in good condition.
 -) The exterior soffit panels around the perimeter of the school were found to contain asbestos. These materials were observed to be in good condition.
 -) Chalkboard adhesive should be assumed to be present and to contain asbestos. The majority of chalkboards in the school were fastened in a manner which prevented AERO from collecting samples in a reasonably non-destructive fashion. Estimated quantities of this material were based on the size and number of chalkboards present in each area.
 -) Wood clad fire doors were observed in the corridors of the school. The UL fire-rating label were observed on the hinge edge of the doors. Therefore, AERO has assumed that these fire-rated wood clad doors contain asbestos. The doors were observed to be in good condition.
- (3) Floor tiles and associated mastic in the building were previously determined to contain asbestos. The EPA classifies these materials as Category I non-friable materials. All floor tiles and floor mastics were observed to be in good condition. The EPA regulates Category I non-friable materials (resilient floor coverings, asphalt roof products, gaskets, and packings) only when they are rendered friable. A licensed asbestos abatement contractor should remove these materials prior to demolition that would result in their disturbance.

- (4) Painted surfaces identified as being covered with paint containing lead in any concentration must be handled in accordance with 29 CFR 1926.62, the OSHA Lead Exposure in Construction Standard. Therefore, AERO recommends notifying contractors of all known lead-containing paints prior to bidding on work at the Site.
- (5) Representative demolition waste stream samples of the anticipated waste stream were not collected at the time of this survey due to the destructive nature of the sampling. Waste stream samples should be collected and analyzed by TCLP for leachable lead to determine proper disposal requirements.

EPA regulations concerning lead hazardous waste require the collection of representative samples of demolition waste streams. If TCLP analysis reveals a leachate concentration of 5 parts per million (ppm) lead or higher, the waste stream must be treated as hazardous waste and handled accordingly. While there is no way to be certain that the TCLP results will fall below 5 ppm, it is AERO's opinion that TCLP results from the eventual waste streams, if left largely unsegregated, are unlikely to exceed EPA limits.

- (6) All light ballasts inspected had "No PCB" identification markings; therefore, all inspected ballasts were assumed not to contain PCBs. However, the rotating light fixtures in the shop areas were inaccessible at the time of the survey due to their height. These lights should be inspected for "No-PCBs" markings prior to their disposal.

If light ballasts are encountered that do not have a "no PCBs" marking on the label, the light ballasts should be removed from the Site prior to demolition/renovation of the on-site structures. Procedures for disposal of PCB light ballasts should be included in an abatement specification. Handling and disposal should be done in accordance with EPA requirements in TSCA and RCRA as well as applicable state and local regulations.

- (7) AERO was informed by FCPS maintenance personnel that the transformer located near the exterior boiler room entrance is the property of Potomac Edison. The transformer has no labeling on it stating that it does not contain any PCB fluid. AERO recommends that FCPS contact Potomac Edison and request they remove their transformer prior to demolition of the building.
- (8) Fluorescent light tubes potentially contain mercury vapor. These items should be removed intact from the Site prior to the demolition/renovation of the on-site structures. Procedures for disposal of fluorescent light tubes should be included in an abatement specification. These items should be handled and disposed/recycled as a universal waste in accordance with EPA RCRA requirements as well as applicable state and local regulations.

- (9) All refrigerants should be removed (recycled) from all non-portable equipment and all portable equipment slated for disposal prior to demolition of the structure. Removal of refrigerants from this equipment should be included in an abatement specification. Freon® or other refrigerants should be properly reclaimed from the equipment by a licensed HVAC contractor and recycled by a licensed recycler according to Federal, state, and local regulations prior to demolition of the structure.
- (10) AERO determined that a 10,000-gallon heating oil tank is located underground on the east side of the school. The 10,000-gallon UST will need to be removed in accordance with MDE requirements, which includes routine MDE notification and involvement, documentation of UST removal, and submittal of closure reports to the MDE.
- (11) Creosote-coated wood planks used to cover underground utilities should be properly handled and disposed of when encountered during any grading activities at the site.
- (12) Chemicals associated with operation of the mechanical equipment in the boiler room, custodial cleaning chemicals, and other commercial cleaning products were observed throughout the building. AERO observed no evidence of chemical spills. Any chemicals and products which still have a use for FCPS should be removed from the school prior to demolition of the structure. If any of these products remain in the school, they will require collection, waste characterization, and proper disposal prior to any demolition activities.

APPENDIX A

WAVERLEY ELEMENTARY SCHOOL ROOM NUMBER DRAWINGS



APPENDIX B

BULK ASBESTOS LAB REPORTS



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 40 CFR, Part 763, Subpart E,
App.E



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Derrick Cooper
Mike Derdeyn

Lab Order ID: 51832967
Analysis ID: 51832967_PLM
Date Received: 12/12/2018
Date Reported: 12/15/2018

Project: Waverley ES

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
120718-WES01	Black damproofing on ext foundation	None Detected		100% Other	Black Non Fibrous Homogeneous
51832967PLM_1					Dissolved
120718-WES02	Black damproofing on ext foundation	None Detected		100% Other	Black Non Fibrous Homogeneous
51832967PLM_2					Dissolved
120718-WES03	Black damproofing on ext foundation	None Detected		100% Other	Black Non Fibrous Homogeneous
51832967PLM_3					Dissolved
120718-WES04	Asbestos cement soffit panels	12% Chrysotile		88% Other	Gray Fibrous Homogeneous
51832967PLM_4					Crushed
120718-WES05	Roof field	None Detected	15% Cellulose 10% Fiber Glass	75% Other	Black Fibrous Homogeneous
51832967PLM_5					Dissolved
120718-WES06	Black sealant on metal flashing	None Detected	20% Cellulose	80% Other	Black Non Fibrous Homogeneous
51832967PLM_6					Dissolved
120718-WES07	Curb flashing w/silver paint	None Detected	10% Cellulose 10% Synthetic Fibers 10% Fiber Glass	70% Other	Silver, Black Fibrous Homogeneous
51832967PLM_7					Dissolved
120718-WES08	Roof field	None Detected	15% Synthetic Fibers 10% Cellulose 5% Fiber Glass	70% Other	Silver Fibrous Homogeneous
51832967PLM_8					Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAL. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Charmel Dozier (16)

Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 40 CFR, Part 763, Subpart E,
App.E



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City, MD 21042

Attn: Derrick Cooper
Mike Derdeyn

Lab Order ID: 51832967
Analysis ID: 51832967_PLM
Date Received: 12/12/2018
Date Reported: 12/15/2018

Project: Waverley ES

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
120718-WES09	Red/brown roof shingles	None Detected	20% Fiber Glass	80% Other	Red Fibrous Homogeneous
51832967PLM_9					Dissolved
120718-WES10	Red/brown roof shingles	None Detected	20% Fiber Glass	80% Other	Red Fibrous Homogeneous
51832967PLM_10					Dissolved
120718-WES11	Brown roof shingles	None Detected	20% Fiber Glass	80% Other	Brown Fibrous Homogeneous
51832967PLM_11					Dissolved
120718-WES12	Brown roof shingles	None Detected	20% Fiber Glass	80% Other	Brown Fibrous Homogeneous
51832967PLM_12					Dissolved
120718-WES13	White sealant on metal flashing	None Detected		100% Other	Gray Non Fibrous Homogeneous
51832967PLM_13					Dissolved
120718-WES14	Flashing, white roll	None Detected	20% Synthetic Fibers 5% Fiber Glass	75% Other	White, Black Fibrous Homogeneous
51832967PLM_14					Dissolved
120718-WES15	Flashing, white roll	None Detected	10% Synthetic Fibers	90% Other	White, Black Fibrous Homogeneous
51832967PLM_15					Dissolved
120718-WES16	Roll roofing, patch	None Detected	20% Synthetic Fibers	80% Other	White, Black Fibrous Homogeneous
51832967PLM_16					Dissolved

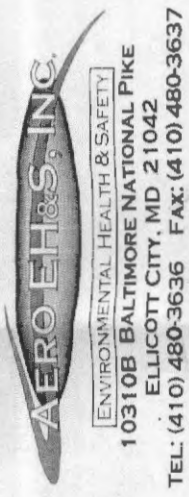
Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAL. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Charmel Dozier (16)

Analyst

Approved Signatory

51832967



BULK ASBESTOS SAMPLE SHEET

Requested Turnaround Time
 Immed. 24hr 3 day 5 day
 Results Needed By:

(10/2)

Inspectors: Dearden/Cooper

Client/Job Number: FPS
 Project Name: WATERLEY ES
 Project Location: FREDERICK, MD

Date Sampled: 12/7/18 120718 WES

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Frangible Y/N	Sample Description	Comments	Sample Number
C WING	-	MISC			G	N	BLACK DOWNSPROOFING ON EXT. FOUNDATION		120718 <u>WES</u> 01
"	-	MISC			G	N	"		02
"	-	MISC			G	N	"		03
EXTERIOR	"	MISC	2'x8'		G	N	ASBESTOS CEMENT SOFFIT PANELS		04
ROOF	R	RF			G	N	ROOF FIELD		05
"	R	MISC			G	N	BLACK SEALANT ON METAL FLASHING		06
"	R	MISC			G	N	CURB FLASHING w/ SILVER PAINT		07
"	R	MISC RF			G	N	ROOF FIELD		08
"	R	MISC			G	N	RED/BROWN ROOF SHINGLES		09, 10
"	R	MISC			G	N	BROWN ROOF SHINGLES		11, 12
"	R	MISC			G	N	WHITE SEALANT ON METAL FLASHING		13
"	R	MISC			G	N	FLASHING, WHITE ROLL		14, 15

Accepted ☒ Rejected ☐

Chain of Custody

Sampled By: S.M. Dearden Received By: _____
 Signature: [Signature] Signature: _____
 Date/Time: 12/7/18 Date/Time: _____
 Lab Custody: _____
 Signature: [Signature] Date/Time: 12-12-2018

AERO EH&S, INC.
ENVIRONMENTAL HEALTH & SAFETY
10500 BAYVIEW BLVD., SUITE 100, BAYVIEW, MI 48064-1500
TEL: 313/751-1000 FAX: 313/751-1001
WWW.AEROEH&S.COM

521

Wander ES

FREDERICK, MD

Inspectors:

DeWeyn / Cooper

Date Sampled:

12/7/18

120718-WBS

Requested Turnaround Time
Immed. 24hr 3 day 5 day

[illegible]

Chain of Custody

S. M. D. 2003

Received By:

[Signature]

Signature: _____

12/18

Date/Time

Transported By

Lab Custody:

Signature: _____

Signature: _____

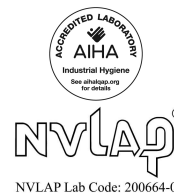
Date/Time

Date/Time:



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Project: Waverly ES Re- Inspection

Date Reported: 12/27/2010

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES01 - A	FT01 12"x12" tan floor tile w/light brown & beige mottle	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1014905PLM_1	tile				Dissolved
121610WES01 - B	FT01 12"x12" tan floor tile w/light brown & beige mottle	None Detected	2% Cellulose	98% Other	Yellow Non Fibrous Homogeneous
1014905PLM_38	mastic				Dissolved
121610WES02 - A	FT02 12"x12" gray floor tile w/brown, white, & dark grey mottle	None Detected		100% Other	Gray, Olive Non Fibrous Heterogeneous
1014905PLM_2	tile				Dissolved
121610WES02 - B	FT02 12"x12" gray floor tile w/brown, white, & dark grey mottle	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_39	mastic				Dissolved
121610WES03 - A	FT03 12"x12" maroon floor tile w/dark red & pink mottle	None Detected		100% Other	Red Non Fibrous Heterogeneous
1014905PLM_3	tile				Dissolved
121610WES03 - B	FT03 12"x12" maroon floor tile w/dark red & pink mottle	None Detected	2% Cellulose	98% Other	Yellow Non Fibrous Homogeneous
1014905PLM_40	mastic				Dissolved
121610WES04 - A	FT04 12"x12" pink floor tile w/dark pink & white mottle	None Detected		100% Other	Pink Non Fibrous Heterogeneous
1014905PLM_4	tile				Dissolved
121610WES04 - B	FT04 12"x12" pink floor tile w/dark pink & white mottle	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_41	mastic				Dissolved

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Sharon Donald (54)

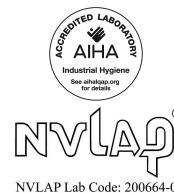
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES05 - A	FT05 12"x12" white floor tile w/gray specks	None Detected		100% Other	Gray, White Non Fibrous Heterogeneous
1014905PLM_5	tile				Dissolved
121610WES05 - B	FT05 12"x12" white floor tile w/gray specks	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_42	mastic				Dissolved
121610WES06 - A	FT06 9"x9" white floor tile w/green & grey streaks	4% Chrysotile		96% Other	White, Olive Non Fibrous Heterogeneous
1014905PLM_6	tile				Dissolved
121610WES06 - B	FT06 9"x9" white floor tile w/green & grey streaks	6% Chrysotile		94% Other	Black Non Fibrous Homogeneous
1014905PLM_43	mastic				Dissolved
121610WES07 - A	TF01 3'x3' terrazzo flooring w/dark green, green, & grey stones	None Detected		100% Other	White, Green Non Fibrous Heterogeneous
1014905PLM_7	terrazzo				Crushed
121610WES07 - B	TF01 3'x3' terrazzo flooring w/dark green, green, & grey stones	None Detected	5% Cellulose	95% Other	Brown Non Fibrous Homogeneous
1014905PLM_44	mastic				Dissolved
121610WES 08	CT01 12"x12" spline tile w/gouges & large holes	None Detected	60% Cellulose 30% Mineral Wool	10% Other	Gray, White Fibrous Heterogeneous
1014905PLM_8					Teased
121610WES 09	CT02 12"x12" spline tile w/ EW fissures & small holes	None Detected	85% Mineral Wool	15% Other	Gray, White Fibrous Heterogeneous
1014905PLM_9					Teased

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Sharon Donald (54)

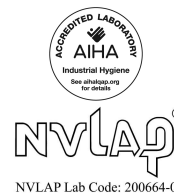
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES10	CT03 2'x2' ceiling tiles w/deep gouges, small & medium holes	None Detected	60% Mineral Wool 30% Cellulose	10% Other	Gray, White Fibrous Heterogeneous
1014905PLM_10					Teased
121610WES11	CT04 2'x2' ceiling tile w/EW fissures, medium & small holes	None Detected	50% Cellulose 30% Mineral Wool	10% Perlite 10% Other	Gray, White Fibrous Heterogeneous
1014905PLM_11					Teased
121610WES12	CT05 2'x2' ceiling tile w/nicks & medium holes	None Detected	50% Cellulose 30% Mineral Wool	10% Perlite 10% Other	Gray, White Fibrous Heterogeneous
1014905PLM_12					Teased
121610WES13	CT06 12"x12" spline tile w/deep long fissures	None Detected	50% Cellulose 30% Mineral Wool	10% Perlite 10% Other	Gray, White Fibrous Heterogeneous
1014905PLM_13					Teased
121610WES14	CT07 2'x4' ceiling tile w/EW fissures, medium & small holes	None Detected	85% Mineral Wool	15% Other	White Fibrous Heterogeneous
1014905PLM_14					Teased
121610WES15	DWJC drywall w/joint compound	None Detected	15% Cellulose	55% Gypsum 30% Other	Brown, White Fibrous Heterogeneous
1014905PLM_15	sheetrock: none detect; joint compnd: none detect				Teased
121610WES16 - A	CB01-4" maroon covebase (vinyl)	None Detected		100% Other	Red Non Fibrous Homogeneous
1014905PLM_16	covebase				Ashed
121610WES16 - B	CB01-4" maroon covebase (vinyl)	None Detected		100% Other	Brown, Cream Non Fibrous Heterogeneous
1014905PLM_45	mixed mastics				Dissolved

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Sharon Donald (54)

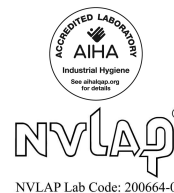
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES17 - A	CB02 4" black covebase (vinyl)	None Detected		100% Other	Black Non Fibrous Homogeneous
1014905PLM_17	covebase				Ashed
121610WES17 - B	CB02 4" black covebase (vinyl)	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_46	mastic				Dissolved
121610WES18 - A	CB03-4" brown covebase (vinyl)	None Detected		100% Other	Brown Non Fibrous Homogeneous
1014905PLM_18	covebase				Ashed
121610WES18 - B	CB03-4" brown covebase (vinyl)	None Detected		100% Other	Brown Non Fibrous Homogeneous
1014905PLM_47	mastic				Dissolved
121610WES19 - A	CB04 4" navy blue covebase (vinyl)	None Detected		100% Other	Black Non Fibrous Homogeneous
1014905PLM_19	covebase				Ashed
121610WES19 - B	CB04 4" navy blue covebase (vinyl)	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_48	mastic				Dissolved
121610WES 20	M01 12"x12" acoustical tile w/small holes	None Detected		100% Other	White, Black Non Fibrous Heterogeneous
1014905PLM_20	white coating on foamglass				Dissolved
121610WES 21	M02 brown glue dots for spline & acoustical tile	None Detected		100% Other	Tan Non Fibrous Homogeneous
1014905PLM_21					Dissolved

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Sharon Donald (54)

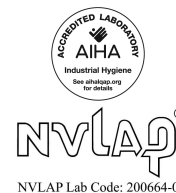
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES 22	M03 white seam mastic on FG wrapped pipe	None Detected		100% Other	White Non Fibrous Homogeneous
1014905PLM_22					Dissolved
121610WES 23	M04 black/cream mastic on FG wrapped pipe	15% Chrysotile		85% Other	Black Non Fibrous Homogeneous
1014905PLM_23					Dissolved
121610WES 24	M05 black mastic on FG foil duct insulation	15% Chrysotile		85% Other	Black Non Fibrous Homogeneous
1014905PLM_24					Dissolved
121610WES 25	M06 white seam mastic on foam pipe insulation	None Detected		100% Other	White Non Fibrous Homogeneous
1014905PLM_25					Dissolved
121610WES 26	M07 black bituminous pipe wrap	None Detected	15% Cellulose	85% Other	Black Non Fibrous Homogeneous
1014905PLM_26					Dissolved
121610WES 27	M08 black end-cap mastic on FG pipe insulation	None Detected	10% Cellulose 10% Fiber Glass	80% Other	Black Non Fibrous Homogeneous
1014905PLM_27					Dissolved
121610WES 28	M09 white end cap mastic on FG boiler insulation	None Detected	15% Cellulose	85% Other	White Non Fibrous Homogeneous
1014905PLM_28					Dissolved
121610WES 29	M10 white seam mastic on FG boiler insulation	None Detected	5% Cellulose	95% Other	White Non Fibrous Homogeneous
1014905PLM_29					Dissolved

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Sharon Donald (54)

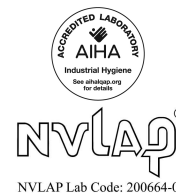
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: AERO EH&S Inc.
10310-B Baltimore National Pike
Ellicott City MD 21042

Attn: Sheppard Kelly

Lab Order ID: 1014905

Analysis ID: 1014905_PL

Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES30	M11 gray mastic on metal duct	None Detected		100% Other	Gray Non Fibrous Homogeneous
1014905PLM_30					Ashed
121610WES31 - A	ST01 brown stair tread w/white streaks	None Detected		100% Other	Brown Non Fibrous Homogeneous
1014905PLM_31	stair tread				Ashed
121610WES31 - B	ST01 brown stair tread w/white streaks	None Detected		100% Other	Yellow Non Fibrous Homogeneous
1014905PLM_49	mastic				Dissolved
121610WES32 - A	P01 3-6" mudded pipe fitting insulation	None Detected	80% Cellulose	20% Other	White Fibrous Heterogeneous
1014905PLM_32	wrap				Teased, Dissolved
121610WES32 - B	P01 3-6" mudded pipe fitting insulation	5% Amosite	30% Mineral Wool	65% Other	Gray Fibrous Heterogeneous
1014905PLM_50	mud				Teased
121610WES33 - A	P01 3-6" mudded pipe fitting insulation	None Detected	80% Cellulose	20% Other	White Fibrous Heterogeneous
1014905PLM_33	wrap				Teased, Dissolved
121610WES33 - B	P01 3-6" mudded pipe fitting insulation	Not Analyzed			
1014905PLM_51	mud				
121610WES34	P01 3-6" mudded pipe fitting insulation	Not Analyzed			
1014905PLM_34	mud only				

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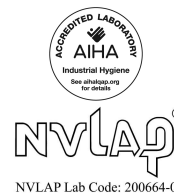
Analyst

Approved Signatory



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



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10310-B Baltimore National Pike
Ellicott City MD 21042

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Date Received: 12/20/2010

Date Reported: 12/27/2010

Project: Waverly ES Re- Inspection

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
121610WES35 - A	P02 6-12" mudded pipe fitting insulation	None Detected	90% Cellulose	10% Other	White Fibrous Heterogeneous
1014905PLM_35	wrap				Teased
121610WES35 - B	P02 6-12" mudded pipe fitting insulation	5% Amosite	30% Mineral Wool	65% Other	Gray Fibrous Heterogeneous
1014905PLM_52	mud				Teased
121610WES36 - A	P02 6-12" mudded pipe fitting insulation	None Detected	90% Cellulose	10% Other	White Fibrous Heterogeneous
1014905PLM_36	wrap				Teased
121610WES36 - B	P02 6-12" mudded pipe fitting insulation	Not Analyzed			
1014905PLM_53	mud				
121610WES37 - A	P02 6-12" mudded pipe fitting insulation	None Detected	90% Cellulose	10% Other	White Fibrous Heterogeneous
1014905PLM_37	wrap				Teased
121610WES37 - B	P02 6-12" mudded pipe fitting insulation	Not Analyzed			
1014905PLM_54	mud				

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Sharon Donald (54)

Analyst

Approved Signatory

Email Results to: Kelly@AEROEH&S.COM

BULK ASBESTOS SAMPLE SHEET

ENVIRONMENTAL HEALTH & SAFETY
10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637



1014905

Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Project Name: Waverly ES Re-Inspection
Project Location: Frederick, MD
Client/Job Number:

Inspectors: Kelly Van Deusen

1 of 4

Date Sampled: 12/16/10

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Friable? Y/N	Sample Description	Comments	Sample Number
C-3	1	Misc.	12"x12"		C	N	FT01 - 12"x12" Tan Floor Tile w/ Light Brown & Beige mottle	w/ mastic	121610WES 01
Stage	1	Misc.	12"x12"		C	N	FT02 - 12"x12" Gray Floor tile w/ Brown, white & Dark Gray Mottle	w/ mastic	121610WES 02
Hallway #2	1	Misc.	12"x12"		C	N	FT03 - 12"x12" Maroon Floor tile w/ Dark Purple & Pink mottle	w/ mastic	121610WES 03
Hallway #5	1	Misc.	12"x12"		C	N	FT04 - 12"x12" Pink Floor tile w/ Dark Pink & white mottle	w/ mastic	121610WES 04
Gymnasium Storage	1	Misc.	12"x12"		C	N	FT05 - 12"x12" white Floor tile w/ Gray Speckles	w/ mastic	121610WES 05
A-4	1	Misc.	9"x9"		C	N	FT06 - 9"x9" white Floor tile w/ Green & Gray streaks	w/ mastic	121610WES 06
Hallway #6	1	Misc.	3'x3'		C	N	TF01 - 3'x3' Terrazzo flooring w/ Dark Green, Green & Gray stones		121610WES 07
B-1	1	Misc.	12"x12"		C	N	CT01 - 12"x12" Spine Tile w/ Gouges & Large Holes		121610WES 08
B-2	1	Misc.	12"x12"		C	N	CT02 - 12"x12" Spine tile w/ SW Fissures & Small Holes		121610WES 09
C-8	1	Misc.	2'x2'		C	Y	CT03 - 2'x2' Ceiling tile w/ Deep Gouges, small & medium holes		121610WES 10
Hallway #2	1	Misc.	2'x2'		C	Y	CT04 - 2'x2' Ceiling tile w/ SW Fissures, medium & small holes	Accepted	121610WES 11
B-14	1	Misc.	2'x2'		C	Y	CT05 - 2'x2' Ceiling tile w/ cracks & medium sholes	Rejected	121610WES 12

Chain of Custody

Sampled By: Stephen Kelly
Signature: [Signature]
Date/Time: 12/16/10 9:00AM

Received By: [Signature]
Signature: [Signature]
Date/Time: 12-20 9:30

Transported By: [Signature]
Signature: [Signature]
Date/Time: 12-20 9:30

Lab Custody: [Signature]
Signature: [Signature]
Date/Time: 12-20 9:30

BULK ASBESTOS SAMPLE SHEET



ENVIRONMENTAL HEALTH & SAFETY
10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Project Name: Waverly ES Re-Inspection
Project Location: Frederick, MD
Client/Job Number: _____

Inspectors: Kelly Van Deusen Zofy
Date Sampled: 12/16/10

1014905

Requested Turnaround Time
Immed. 24hr 3 day 5 day
Results Needed By:

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Friable? Y/N	Sample Description	Comments	Sample Number
B-12	1	Misc.	12" x 12"		C	N	CT06 - 12" x 12" Sphintex w/ Deep Layer Fibers		121610WES 13
Gymnasium Storage	1	Misc	2' x 4'		C	Y	CT07 - 2' x 4' Ceiling tile w/ Fiberglass Medium & small holes		121610WES 14
B-16	1	Misc.	N/A		C	N	DUSE - Physical w/ Joint compound		121610WES 15
Hallway #3	1	Misc.	4"		C	N	CB01 - 4" Plaster concrete (Vinyl)	w/ mastic	121610WES 16
B-2	1	Misc.	4"		C	N	CB02 - 4" Block concrete (Vinyl)	w/ mastic	121610WES 17
C-6	1	Misc.	4"		C	N	CH03 - 4" Brown concrete (Vinyl)	w/ mastic	121610WES 18
Hallway #6 Storage	1	Misc	4"		C	N	CB04 - 4" Navy blue concrete (Vinyl)	w/ mastic	121610WES 19
Stage	1	Misc	12" x 12"		C	Y	M01 - 12" x 12" acoustical tile w/ small holes		121610WES 20
B-1	1	Misc.	N/A		C	N	M02 - Glue dots for spline & Acoustical tile		121610WES 21
Hallway #6	1	Misc.	N/A		C	N	M03 - White Seam mastic on F.G. wrapped pipe		121610WES 22
C-2/C-5 Storage	1	Misc	N/A		C	N	M04 - Black Mastic on F.G. wrapped pipe		121610WES 23
Speech Room	1	Misc.	N/A		C	U	M05 - Black mastic on F.G. Foil Duct insulation		121610WES 24

Chain of Custody

Sampled By: Stephen Kelly Received By: _____
Signature: [Signature] Signature: _____
Date/Time: 12/17/10 10:00 AM Date/Time: _____
Transported By: _____ Lab Custody: _____
Signature: _____
Date/Time: _____

BULK ASBESTOS SAMPLE SHEET



10310B BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

Requested Turnaround Time
Immed. 24hr 3 day 6 day
Results Needed By:

Project Name: Waverly ES - Re-inspection
Project Location: Frederick, MD
Client/Job Number: _____

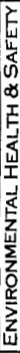
Inspectors: Kelly / Van Deuren
Date Sampled: 12/16/10

3 of 4

Room Name/Number	Floor	Material Type	Diameter / Size	Quantity	Cond	Friable? Y/N	Sample Description	Comments	Sample Number
C-7	1	Misc.	N/A		G	N	M06 - white seam mastic on foam pipe insulation		12/6/06ES 25
Hallway #5 Storage	1	Misc.	N/A		G	N	M07 - black bituminous pipe wrap		12/6/06ES 26
Hallway #5	1	Misc.	N/A		G	N	M08 - black end-cap mastic on F.G. pipe insulation		12/6/06ES 27
Hallway #2 Storage Room #2	1	Misc.	N/A		G	N	M09 - white end-cap mastic on F.G. pipe insulation		12/6/06ES 28
Boiler Room	1	Misc.	N/A		G	N	M10 - white seam mastic on F.G. boiler insulation		12/6/06ES 29
Boiler Room	1	Misc.	N/A		C	N	M11 - Gray mastic on boiler metal duct		12/6/06ES 30
Stage	1	Misc.	N/A		G	N	ST01 - Brown stair tread w/ white streaker	w/ mastic	12/6/06ES 31
Hallway #5 Storage	1	TSI	3-C"		G	Y	PO1 - 3-6" Mudded Pipe Fitting Insulation	Positive Step 1 of 3	12/6/06ES 32
A-5	1	TSI	3-6"		G	Y	PO1 - 3-6" Mudded Pipe Fitting Insulation	2 of 3	12/6/06ES 33
A-1	1	TSI	3-6"		G	Y	PO1 - 3-6" Mudded Pipe Fitting Insulation	3 of 3	12/6/06ES 34
Hallway #5 Storage	1	TSI	6-12"		G	Y	PO2 - 6-12" Mudded Pipe Fitting Insulation	Positive Step 1 of 3	12/6/06ES 35
Hallway #5 Storage	1	TSI	6-12"		G	Y	PO2 - 6-12" Mudded Pipe Fitting Insulation	2 of 3	12/6/06ES 36

Chain of Custody

Sampled By: Stephen Kelly Received By: _____
Signature: [Signature] Signature: _____
Date/Time: 12/17/10 10:00 AM Date/Time: _____
Transported By: _____ Lab Custody: _____
Signature: _____
Date/Time: _____



10310B BALTIMORE NATIONAL PIKE

ELLCOTT CITY, MD 21042
TEL: (410) 480-3636 FAX: (410) 480-3637

TEL: (410) 480-3636 FAX: (410) 480-3637

Project Location: Frederick MD

Client/Job Number: _____

Inspectors:

Date Sampled: 12/6/10

Kells / van Densen

Date Sampled: 12/6/10

4.74

Requested Turn:

Immed. 24hr 3 day 5 day

Results Needed By:[illegible]

Chain of Custody

Sampled By: Stephen Kelly Received By: _____

Received By:

Signature: _____

Signature:

Date/Time: 12/7/10 10:00 AM Date/Time:

Date/Time:

Transported By:

Lab Custody:

Signature:

Signature: _____

Date/Time:

Date/Time:

APPENDIX C

ROOM BY ROOM ACM INVENTORY (AHERA)

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Classroom

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
----------	----------------------	----------	----------	---------------------	---------------------------	-------------------	------------------------------	---------------------------	----------------------------

Room: A-1

M13 Chalkboard Mastic 8 SF No G = Good

Category & Reponse:

Comments:

☐ Removed?

P01 3 - 6" Mudded Pipe Fitting Insu 1 EA Yes G = Good N = None > 5 FT B = Barely
Category & Reponse: 7 - All Remaining ACBM O&M IE = Int. & L = Low P = Air Plenu

Comments:

☐ Removed?

Room: A-2

M13 Chalkboard Mastic 12 SF No G = Good

Category & Reponse:

Comments:

☐ Removed?

P01 3 - 6" Mudded Pipe Fitting Insu 1 EA Yes G = Good N = None > 5 FT B = Barely
Category & Reponse: 7 - All Remaining ACBM O&M IE = Int. & L = Low P = Air Plenu

Comments:

☐ Removed?

Room: A-4

FT06 9" x 9" White Floor Tile with G 150 SF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments:

☐ Removed?

Room: A-5

P01 3 - 6" Mudded Pipe Fitting Insu 16 EA Yes G = Good N = None > 5 FT B = Barely

Category & Reponse: 7 - All Remaining ACBM O&M

Comments:

☐ Removed?

IE = Int. & L = Low

P = Air Plenu

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Office

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
Room: Assistant Principal's Office									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	25 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: B-1									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									
Room: B-10									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									
Room: B-11									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									
Room: B-12									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									
Room: B-13									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Office

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
Mo5	Black Mastic on Fiberglass Foil	AC = Above Ceiling	60 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: B-14									
Mo5	Black Mastic on Fiberglass Foil	AC = Above Ceiling	100 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: B-15									
Mo5	Black Mastic on Fiberglass Foil	AC = Above Ceiling	100 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: B-16									
Mo5	Black Mastic on Fiberglass Foil	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: B-18									
Mo4	Black Seam Mastic on Fiberglass	AC = Above Ceiling	10 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Mo5	Black Mastic on Fiberglass Foil	AC = Above Ceiling	100 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Classroom

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
Room: B-2									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									
Room: B-3									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									
Room: B-4									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									
Room: B-5									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									
Room: B-6									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									
Room: B-7									
M13	Chalkboard Mastic	W = Wall	8 SF	No	G = Good				
Category & Reponse:									
Comments:									
Floor: 1-First									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Classroom

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
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M13 Chalkboard Mastic W = Wall 8 SF No G = Good ☐ Removed?

Category & Reponse:

Comments:

Room: B-8 Floor: 1-First

M04 Black Seam Mastic on Fibergla P = Pipe Insulation 5 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

M13 Chalkboard Mastic W = Wall 8 SF No G = Good

Category & Reponse:

Comments: ☐ Removed?

Room: B-9 Floor: 1-First

M13 Chalkboard Mastic W = Wall 8 SF No G = Good

Category & Reponse:

Comments: ☐ Removed?

Room: C-10 Floor: 1-First

M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 30 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

Room: C-2 Floor: 1-First

M04 Black Seam Mastic on Fibergla AC = Above Ceiling 20 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Classroom

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	50 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
Room: C-2 / C-5 Storage									
M04	Black Seam Mastic on Fibergla	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
Room: C-5									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	70 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
Room: C-9									
M04	Black Seam Mastic on Fibergla	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	75 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
Room: C-9									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						<input type="checkbox"/> Removed?
Comments:									
Room: Dry Storage									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Storage

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
----------	----------------------	----------	----------	---------------------	---------------------------	-------------------	------------------------------	---------------------------	----------------------------

P01 3 - 6" Mudded Pipe Fitting Insu W = Wall 6 EA Yes G = Good

Category & Reponse:

Comments: ☐ Removed?

Room: Hallway #1

M04 Black Seam Mastic on Fibergla AC = Above Ceiling 20 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

Room: Hallway #2

M04 Black Seam Mastic on Fibergla AC = Above Ceiling 150 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

M14 Wood Fire Doors (Labeled)

Category & Reponse:

Comments: ☐ Removed?

Room: Hallway #2 Men's Room

M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 20 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

Room: Hallway #2 Storage #2

M04 Black Seam Mastic on Fibergla AC = Above Ceiling 20 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments: ☐ Removed?

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Restroom

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
Room: Hallway #2 Women's Room									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Hallway #3									
M04	Black Seam Mastic on Fibergla	AC = Above Ceiling	150 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Hallway #4									
M14	Wood Fire Doors (Labeled)		2 EA	No	G = Good				
Category & Reponse:									
Comments: <input type="checkbox"/> Removed?									
Room: Hallway #5									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	10 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Hallway #5									
M04	Black Seam Mastic on Fibergla	AC = Above Ceiling	150 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	250 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First

Functional Space: Hallway

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
----------	----------------------	----------	----------	---------------------	---------------------------	-------------------	------------------------------	---------------------------	----------------------------

M14 Wood Fire Doors (Labeled)

No G = Good

5 EA

Category & Reponse:

Comments:

☐ Removed?

Room: Hallway #5 Storage

Floor: 1-First

P01 3 - 6" Mudded Pipe Fitting Insu P = Pipe Insulation 8 EA Yes G = Good N = None > 5 FT B = Barely

Category & Reponse: 7 - All Remaining ACBM O&M S = Smooth IE = Int. & L = Low P = Air Plenu

Comments:

☐ Removed?

P02 6 - 12" Mudded Pipe Fitting Ins P = Pipe Insulation 6 EA Yes G = Good N = None > 5 FT B = Barely

Category & Reponse: 7 - All Remaining ACBM O&M S = Smooth IE = Int. & L = Low P = Air Plenu

Comments:

☐ Removed?

Room: Hallway #6

Floor: 1-First

M04 Black Seam Mastic on Fibergla AC = Above Ceiling 40 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments:

☐ Removed?

M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 200 LF No G = Good

Category & Reponse: 7 - All Remaining ACBM O&M

Comments:

☐ Removed?

M13 Chalkboard Mastic

W = Wall

No G = Good

4 SF

Category & Reponse:

Comments:

☐ Removed?

M14 Wood Fire Doors (Labeled)

No G = Good

4 EA

Category & Reponse:

Comments:

☐ Removed?

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Hallway

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
Room: Hallway #6 Storage									
P01	3 - 6" Mudded Pipe Fitting Insu	P = Pipe Insulation	2 EA	Yes	G = Good	N = None	N = None	> 5 FT	B = Barely
Category & Reponse:		7 - All Remaining ACBM	O&M	S = Smooth		IE = Int. &	L = Low		P = Air Plenu
Comments:									
P02	6 - 12" Mudded Pipe Fitting Ins	P = Pipe Insulation	5 EA	Yes	G = Good	N = None	N = None	> 5 FT	B = Barely
Category & Reponse:		7 - All Remaining ACBM	O&M	S = Smooth		IE = Int. &	L = Low		P = Air Plenu
Comments:									
Room: Health Room									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	30 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						
Comments:									
Room: Main Office A-8									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	10 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						
Comments:									
Room: Media Center B-17									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	50 LF	No	G = Good				
Category & Reponse:		7 - All Remaining ACBM	O&M						
Comments:									
Room: Media Center Kitchen									
Comments:									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Kitchen

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Media Center Office #1									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	10 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Media Center Office #2									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	15 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Office Storage									
M05	Black Mastic on Fiberglass Foil	P = Pipe Insulation	25 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Office Work Room									
M05	Black Mastic on Fiberglass Foil	AC = Above Ceiling	20 LF	No	G = Good				
Category & Reponse: 7 - All Remaining ACBM									
Comments: <input type="checkbox"/> Removed?									
Room: Principal's Office									

Room by Room Inventory - Waverley Elementary School

Date: 12/17/2010

Inspectors: Stephen Kelly
Brian Van Deusen
NA
NA

Floor: 1-First
Functional Space: Office

ACM Code	Material Description	Location	Quantity	Friable? Texture	Condition Adjacent Rms	Water Barriers	Deterioration Ventilation	Proximity Air Movement	Accessible Air Conduits
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M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 25 LF No G = Good ☐ Removed?

Category & Reponse: 7 - All Remaining ACBM

Comments:

Room: Server Room Floor: 1-First

M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 15 LF No G = Good ☐ Removed?

Category & Reponse: 7 - All Remaining ACBM

Comments:

Room: Speech Room Floor: 1-First

M05 Black Mastic on Fiberglass Foil AC = Above Ceiling 10 LF No G = Good ☐ Removed?

Category & Reponse: 7 - All Remaining ACBM

Comments:

Room: Stage Floor: 1-First

M13 Chalkboard Mastic W = Wall 16 SF No G = Good ☐ Removed?

Category & Reponse:

Comments:

Room: Tractor Shed Floor: 1-First

P01 3 - 6" Mudded Pipe Fitting Insu P = Pipe Insulation 7 EA Yes G = Good N = None B = Barely
Category & Reponse: 7 - All Remaining ACBM O&M S = Smooth IE = Int. & L = Low P = Air Plenu ☐ Removed?

Comments:

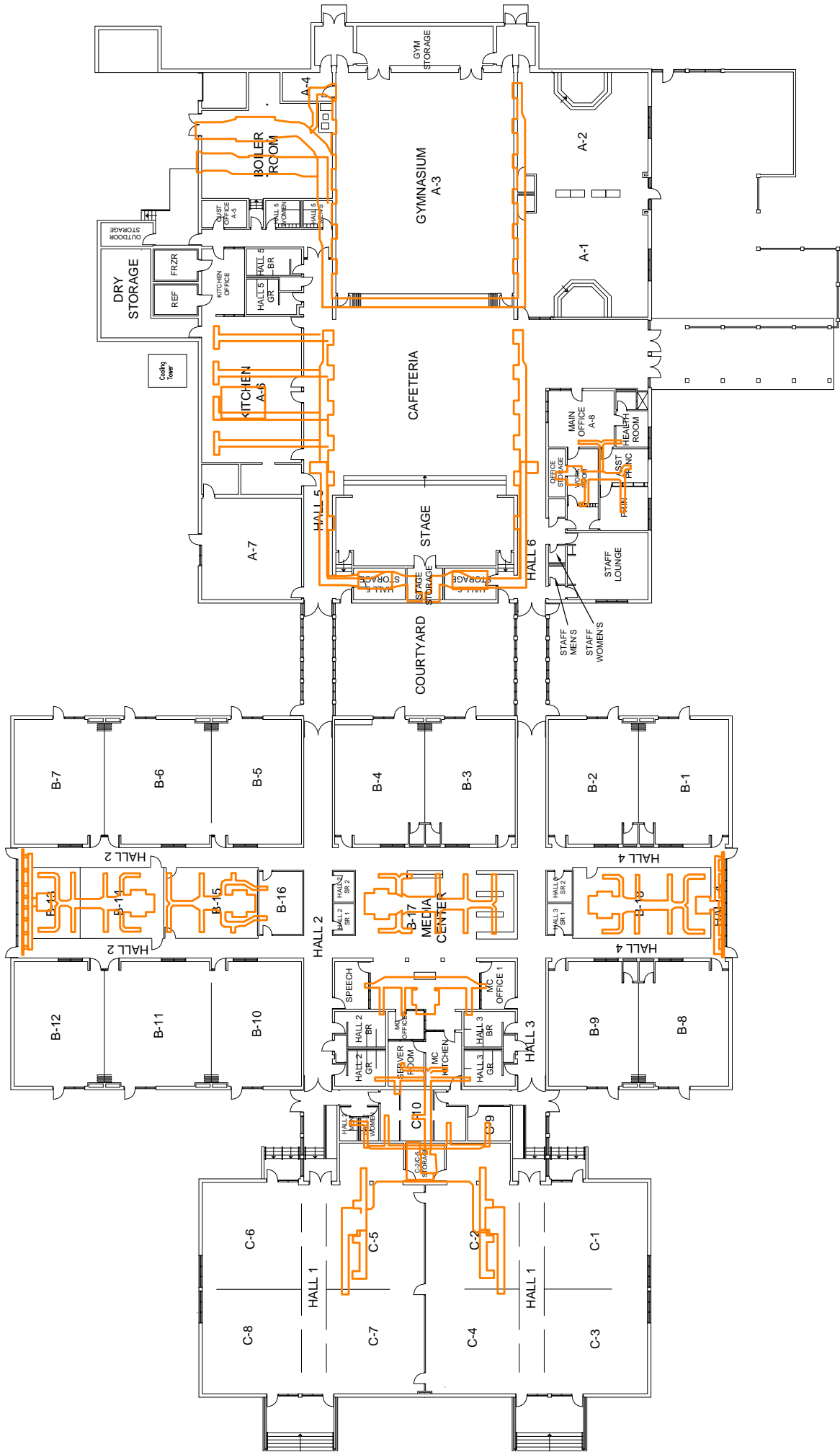
APPENDIX D

ACM MATERIAL LOCATION DRAWINGS

ACM ON FIBERGLASS DUCT INSULATION

ACM ON FIBERGLASS DUCT INSULATION

FIBERGLASS DUCT INSULATION LOCATIONS



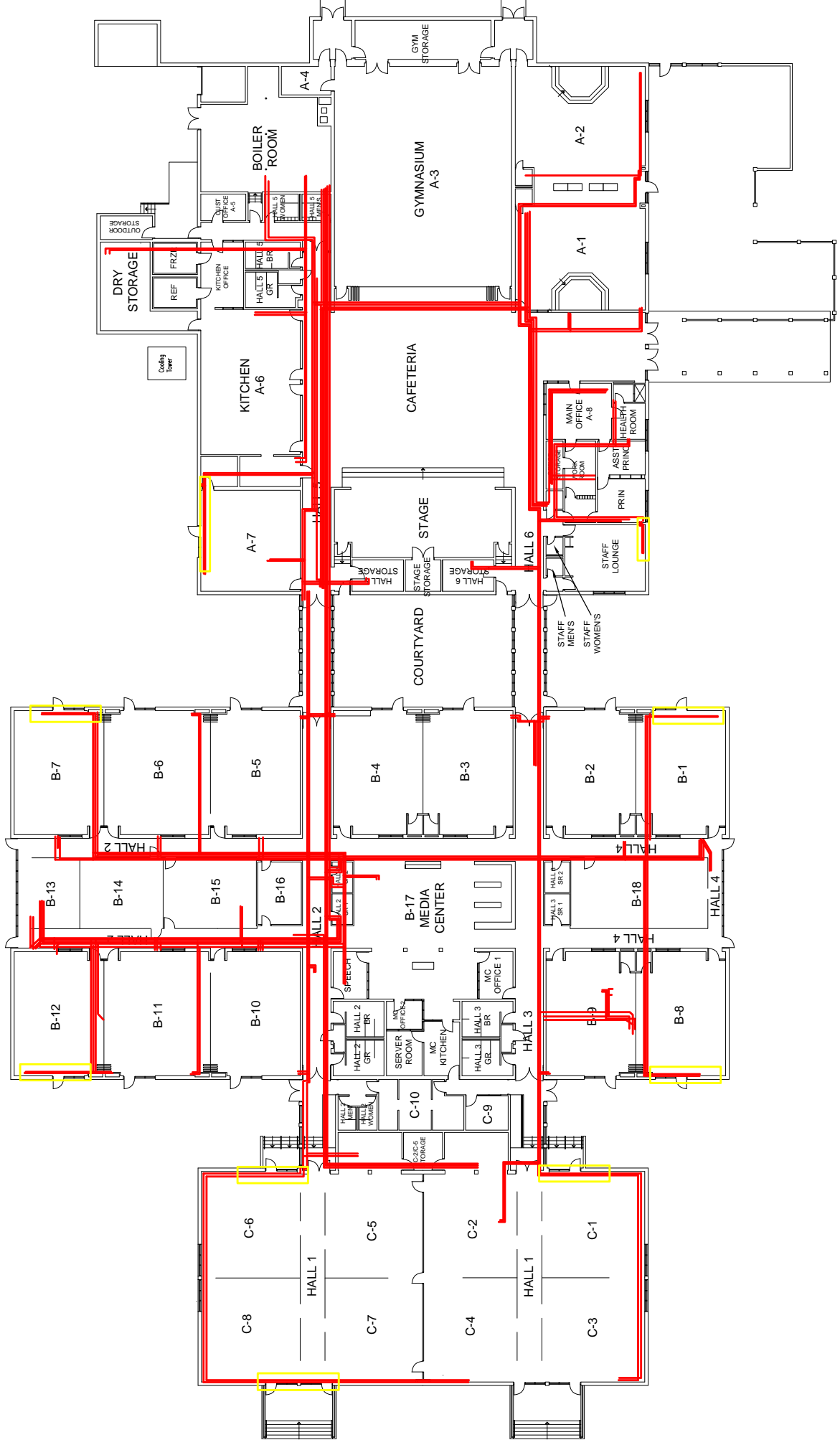
ACM ON FIBERGLASS DUCT INSULATION
WAVERLEY ELEMENTARY SCHOOL
FREDERICK, MD

ACM ON FIBERGLASS PIPE INSULATION

ACM ON FIBERGLASS PIPE INSULATION

— FIBERGLASS PIPE INSULATION LOCATIONS

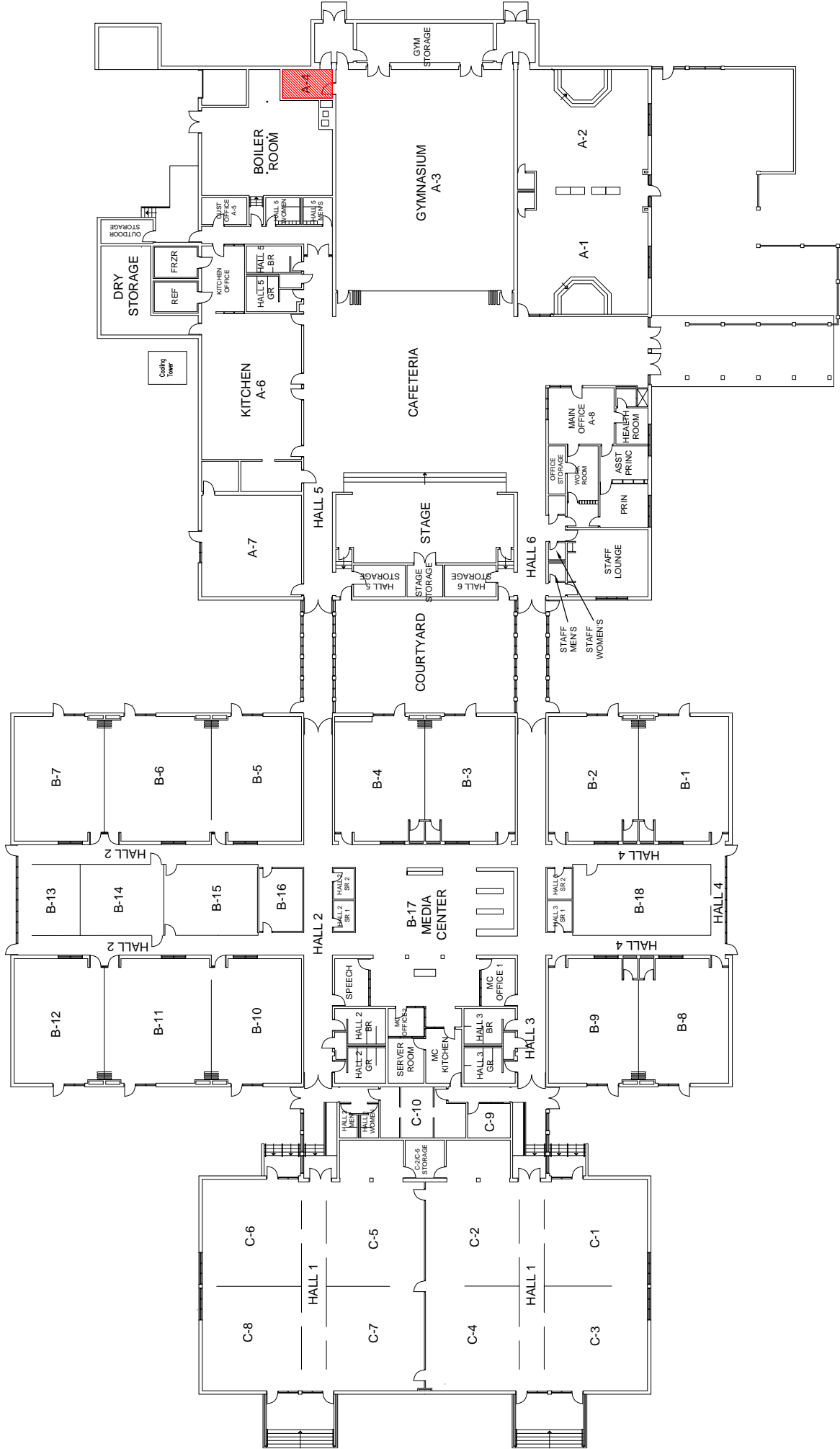
FG PIPE INSULATION IN CONCRETE FLOOR



ACM ON FIBERGLASS PIPE INSULATION
 WAVERLEY ELEMENTARY SCHOOL
 FREDERICK, MD

ACM FLOORING MATERIALS


 ACM FLOORING LOCATIONS



ACM FLOORING MATERIAL LOCATIONS
 WAVERLEY ELEMENTARY SCHOOL
 FREDERICK, MD

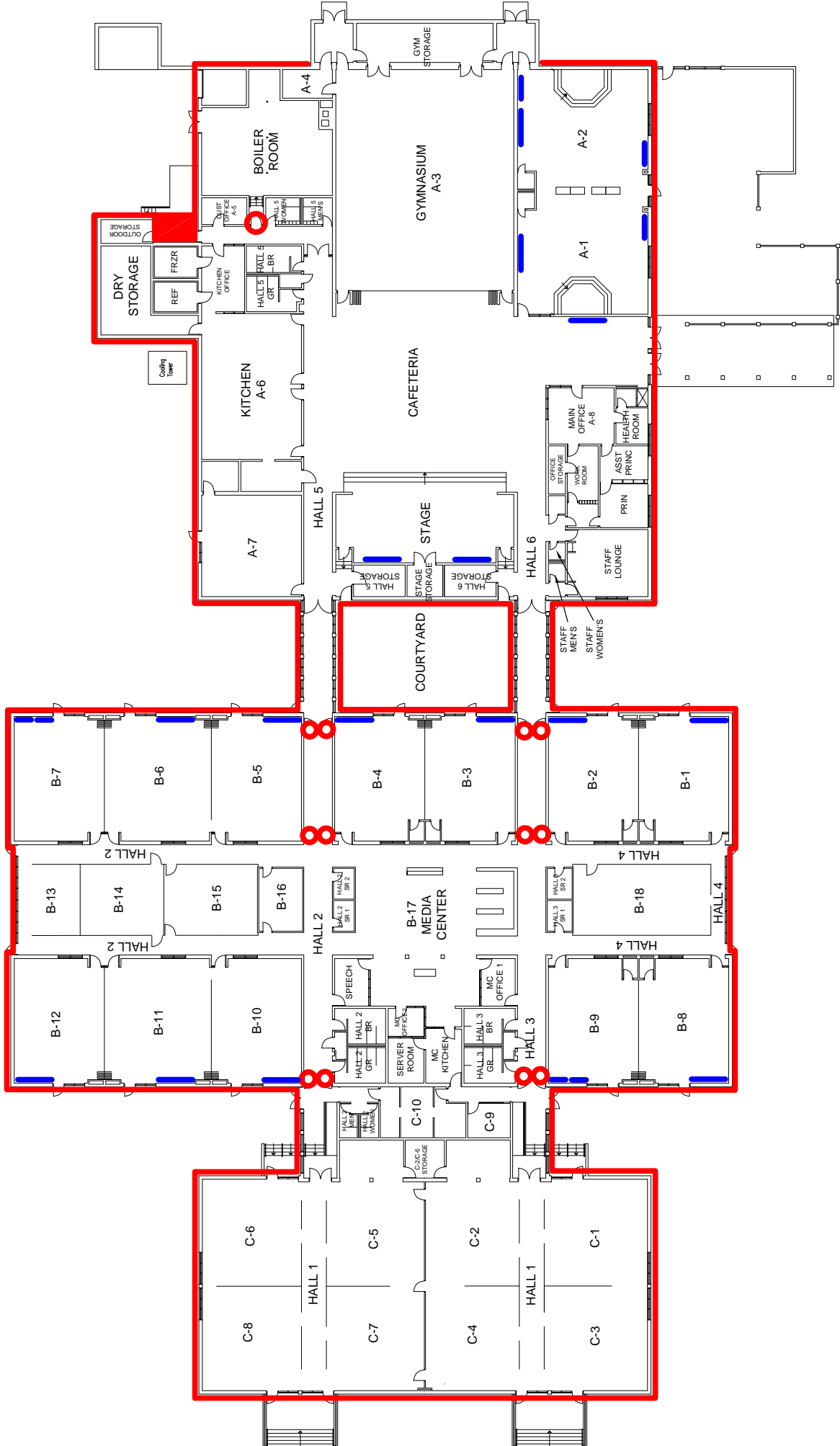
MISCELLANEOUS ACM MATERIALS

MISCELLANEOUS ACM

ASBESTOS CEMENT SOFFIT

BLACKBOARD MASTIC (ASSUMED)

FIRE DOORS (ASSUMED)



MISCELLANEOUS ACM LOCATIONS
 WAVERLEY ELEMENTARY SCHOOL
 FREDERICK, MD

APPENDIX E

XRF READINGS SPREADSHEET

Waverley Elementary School
201 Waverley Drive
Frederick, MD 21702

Reading #	Date	Time	User	Site	Floor	Room	Color	Substrate	Component	Condition	Concentration	Units	Result
1	12/14/2018	14:57:28	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	CALIBRATION	Intact	1.1	mg/cm2	POS
2	12/14/2018	14:57:36	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	CALIBRATION	Intact	1	mg/cm2	POS
3	12/14/2018	14:57:46	Derdeyn	Waverley ES	1-First	Exterior	Red	Concrete	CALIBRATION	Intact	1	mg/cm2	POS
4	12/14/2018	14:57:57	Derdeyn	Waverley ES	1-First	Exterior	Red	Concrete	CALIBRATION	Intact	-0.1	mg/cm2	NEG
5	12/14/2018	14:58:03	Derdeyn	Waverley ES	1-First	Exterior	Red	Concrete	CALIBRATION	Intact	-0.1	mg/cm2	NEG
6	12/14/2018	14:58:10	Derdeyn	Waverley ES	1-First	Exterior	Red	Concrete	CALIBRATION	Intact	-0.1	mg/cm2	NEG
7	12/14/2018	15:04:26	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Door	Intact	0.4	mg/cm2	NEG
8	12/14/2018	15:04:45	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Door Jamb	Intact	0.5	mg/cm2	NEG
9	12/14/2018	15:06:44	Derdeyn	Waverley ES	1-First	Exterior	Red	Concrete	Soffit	Intact	-0.1	mg/cm2	NEG
10	12/14/2018	15:08:06	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Window Casing	Intact	0	mg/cm2	NEG
11	12/14/2018	15:08:29	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Window Casing	Intact	-0.1	mg/cm2	NEG
12	12/14/2018	15:09:28	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Handrail	Intact	1.9	mg/cm2	POS
13	12/14/2018	15:09:44	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Handrail	Intact	1.1	mg/cm2	POS
14	12/14/2018	15:10:41	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Handrail	Intact	2	mg/cm2	POS
15	12/14/2018	15:12:25	Derdeyn	Waverley ES	1-First	Exterior	Silver	Metal	Bike Rack	Intact	0	mg/cm2	NEG
16	12/14/2018	15:13:07	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Window Sash	Intact	0	mg/cm2	NEG
17	12/14/2018	15:14:08	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Door	Intact	0.4	mg/cm2	NEG
18	12/14/2018	15:16:19	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Fence	Intact	1.4	mg/cm2	POS
19	12/14/2018	15:17:06	Derdeyn	Waverley ES	1-First	Exterior	Black	Metal	Fence	Intact	0	mg/cm2	NEG
20	12/14/2018	15:18:02	Derdeyn	Waverley ES	1-First	Exterior	Cream	Concrete	Wall	Intact	-0.1	mg/cm2	NEG
21	12/14/2018	15:18:26	Derdeyn	Waverley ES	1-First	Exterior	Cream	Concrete	Wall	Intact	-0.2	mg/cm2	NEG
22	12/14/2018	15:19:49	Derdeyn	Waverley ES	1-First	Exterior	White	Concrete	Wall Block	Peeling	-0.1	mg/cm2	NEG
23	12/14/2018	15:20:29	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Overhead Door	Intact	-0.1	mg/cm2	NEG
24	12/14/2018	15:20:51	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Lintel	Intact	0.1	mg/cm2	NEG
25	12/14/2018	15:21:36	Derdeyn	Waverley ES	1-First	Exterior	Yellow	Metal	Gas Pipes	Intact	-0.1	mg/cm2	NEG
26	12/14/2018	15:22:23	Derdeyn	Waverley ES	1-First	Exterior	Green	Metal	Transformer	Intact	0	mg/cm2	NEG
27	12/14/2018	15:24:21	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Loading Dock	Peeling	2.4	mg/cm2	POS
28	12/14/2018	15:25:14	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Handrail	Intact	1.9	mg/cm2	POS
29	12/14/2018	15:26:18	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Conduit	Intact	0.3	mg/cm2	NEG
30	12/14/2018	15:26:49	Derdeyn	Waverley ES	1-First	Exterior	Red	Metal	Junction Box	Intact	-0.1	mg/cm2	NEG
31	12/14/2018	15:31:46	Derdeyn	Waverley ES	1-First	Foyer	Red	Metal	Fan Coil Unit	Intact	-0.2	mg/cm2	NEG
32	12/14/2018	15:32:18	Derdeyn	Waverley ES	1-First	Foyer	Black	Metal	Door Jamb	Intact	0.2	mg/cm2	NEG
33	12/14/2018	15:32:35	Derdeyn	Waverley ES	1-First	Foyer	Black	Metal	Door	Intact	-0.1	mg/cm2	NEG
34	12/14/2018	15:39:09	Derdeyn	Waverley ES	1-First	Boiler Room	Blue	Metal	Air Compressor	Intact	-0.1	mg/cm2	NEG
35	12/14/2018	15:39:49	Derdeyn	Waverley ES	1-First	Boiler Room	Green	Metal	Chiller	Intact	0.1	mg/cm2	NEG

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Reading #	Date	Time	User	Site	Floor	Room	Color	Substrate	Component	Condition	Concentration	Units	Result
36	12/14/2018	15:40:24	Derdeyn	Waverley ES	1-First	Boiler Room	Red	Metal	Tank	Intact	0	mg/cm2	NEG
37	12/14/2018	15:40:48	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Pipes	Intact	0	mg/cm2	NEG
38	12/14/2018	15:41:09	Derdeyn	Waverley ES	1-First	Boiler Room	Blue	Metal	Valve	Intact	0	mg/cm2	NEG
39	12/14/2018	15:42:21	Derdeyn	Waverley ES	1-First	Boiler Room	Green	Metal	Pump Motor	Intact	-0.1	mg/cm2	NEG
40	12/14/2018	15:42:41	Derdeyn	Waverley ES	1-First	Boiler Room	Green	Metal	Pump	Intact	0.4	mg/cm2	NEG
41	12/14/2018	15:43:38	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	MCC1	Intact	0	mg/cm2	NEG
42	12/14/2018	15:43:59	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Electrical Panel	Intact	0	mg/cm2	NEG
43	12/14/2018	15:44:29	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Electrical Panel	Intact	0	mg/cm2	NEG
44	12/14/2018	15:44:51	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Electrical Panel	Intact	-0.1	mg/cm2	NEG
45	12/14/2018	15:45:33	Derdeyn	Waverley ES	1-First	Boiler Room	Off White	Concrete	Wall Block	Intact	-0.3	mg/cm2	NEG
46	12/14/2018	15:45:47	Derdeyn	Waverley ES	1-First	Boiler Room	Off White	Concrete	Wall Block	Intact	-0.3	mg/cm2	NEG
47	12/14/2018	15:46:31	Derdeyn	Waverley ES	1-First	Boiler Room	Off White	Brick	Wall	Intact	-0.1	mg/cm2	NEG
48	12/14/2018	15:47:14	Derdeyn	Waverley ES	1-First	Boiler Room	Red	Concrete	Floor	Intact	0.2	mg/cm2	NEG
49	12/14/2018	15:48:00	Derdeyn	Waverley ES	1-First	Boiler Room	Black	Metal	Boiler	Intact	0.1	mg/cm2	NEG
50	12/14/2018	15:51:30	Derdeyn	Waverley ES	1-First	Boiler Room	Black	Metal	Boiler	Intact	-0.1	mg/cm2	NEG
51	12/14/2018	15:52:17	Derdeyn	Waverley ES	1-First	Boiler Room	Blue	Metal	Blower	Intact	-0.1	mg/cm2	NEG
52	12/14/2018	15:52:43	Derdeyn	Waverley ES	1-First	Boiler Room	Yellow	Metal	Gas Pipes	Intact	0	mg/cm2	NEG
53	12/14/2018	15:53:35	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Pump Motor	Intact	0.1	mg/cm2	NEG
54	12/14/2018	15:53:59	Derdeyn	Waverley ES	1-First	Boiler Room	Grey	Metal	Column	Intact	-0.1	mg/cm2	NEG
55	12/14/2018	15:54:40	Derdeyn	Waverley ES	1-First	Boiler Room	Black	Metal	Control Panel	Intact	0	mg/cm2	NEG
56	12/14/2018	15:55:11	Derdeyn	Waverley ES	1-First	Boiler Room	Red	Metal	Handrail	Intact	1.1	mg/cm2	POS
57	12/14/2018	15:55:41	Derdeyn	Waverley ES	1-First	Boiler Room	Red	Metal	Door Jamb	Intact	0.6	mg/cm2	NEG
58	12/14/2018	16:01:01	Derdeyn	Waverley ES	1-First	Bathroom	White	Concrete	Glazed Block	Intact	-0.1	mg/cm2	NEG
59	12/14/2018	16:01:43	Derdeyn	Waverley ES	1-First	Bathroom	Green	Ceramic	Floor Tile	Intact	-0.2	mg/cm2	NEG
60	12/14/2018	16:02:08	Derdeyn	Waverley ES	1-First	Custodial	Off White	Ceramic	Floor Tile	Intact	0.1	mg/cm2	NEG
61	12/14/2018	16:02:30	Derdeyn	Waverley ES	1-First	Custodial	Off White	Wood	Shelf	Intact	-0.2	mg/cm2	NEG
62	12/14/2018	16:05:37	Derdeyn	Waverley ES	1-First	Kitchen	Off White, Speckled	Concrete	Glazed Block	Intact	1.2	mg/cm2	POS
63	12/14/2018	16:05:56	Derdeyn	Waverley ES	1-First	Kitchen	Off White, Speckled	Concrete	Glazed Block	Intact	0.7	mg/cm2	POS
64	12/14/2018	16:07:17	Derdeyn	Waverley ES	1-First	Kitchen	Off White	Metal	Freezer Door	Intact	-0.1	mg/cm2	NEG
65	12/14/2018	16:08:18	Derdeyn	Waverley ES	1-First	Kitchen	White	Drywall	Ceiling	Intact	0	mg/cm2	NEG
66	12/14/2018	16:10:19	Derdeyn	Waverley ES	1-First	Kitchen	Brown	Ceramic	Floor Tile	Intact	0.2	mg/cm2	NEG
67	12/14/2018	16:12:02	Derdeyn	Waverley ES	1-First	Cafeteria	Varnish	Wood	Floor	Intact	0	mg/cm2	NEG
68	12/14/2018	16:12:55	Derdeyn	Waverley ES	1-First	Cafeteria	Varnish	Wood	Railing	Intact	-0.4	mg/cm2	NEG
69	12/14/2018	16:13:43	Derdeyn	Waverley ES	1-First	Cafeteria	Beige	Metal	"Porch Lift"	Intact	-0.1	mg/cm2	NEG
70	12/14/2018	16:16:29	Derdeyn	Waverley ES	1-First	Classroom	Varnish	Wood	Cabinet	Intact	-0.1	mg/cm2	NEG

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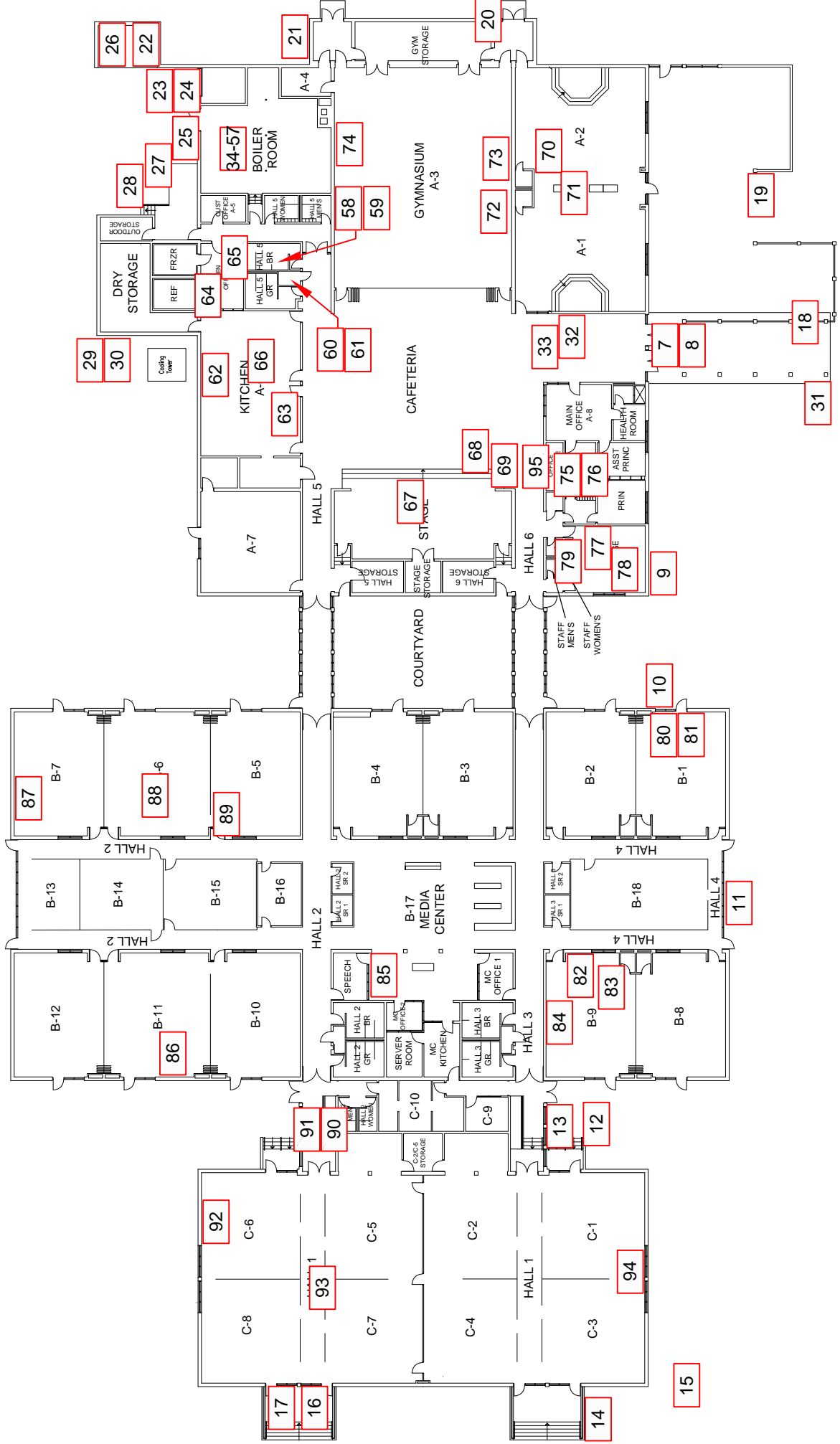
Reading #	Date	Time	User	Site	Floor	Room	Color	Substrate	Component	Condition	Concentration	Units	Result
71	12/14/2018	16:21:57	Derdeyn	Waverley ES	1-First	Classroom	White	Drywall	Ceiling	Intact	-0.1	mg/cm2	NEG
72	12/14/2018	16:23:33	Derdeyn	Waverley ES	1-First	Gym	White	Concrete	Glazed Block	Intact	0.1	mg/cm2	NEG
73	12/14/2018	16:23:49	Derdeyn	Waverley ES	1-First	Gym	Yellow	Concrete	Glazed Block	Intact	2.3	mg/cm2	POS
74	12/14/2018	16:24:27	Derdeyn	Waverley ES	1-First	Gym	Yellow	Concrete	Glazed Block	Intact	2.6	mg/cm2	POS
75	12/14/2018	16:26:06	Derdeyn	Waverley ES	1-First	Office	Red	Metal	Fan Coil Unit	Intact	-0.1	mg/cm2	NEG
76	12/14/2018	16:27:05	Derdeyn	Waverley ES	1-First	Office	Varnish	Wood	Shelf	Intact	-0.1	mg/cm2	NEG
77	12/14/2018	16:30:07	Derdeyn	Waverley ES	1-First	Lounge	Off White	Drywall	Wall	Intact	-0.2	mg/cm2	NEG
78	12/14/2018	16:30:50	Derdeyn	Waverley ES	1-First	Lounge	Off White	Wood	Crown Molding	Intact	-0.3	mg/cm2	NEG
79	12/14/2018	16:31:37	Derdeyn	Waverley ES	1-First	Lounge	Varnish	Wood	Cabinet	Intact	0	mg/cm2	NEG
80	12/14/2018	16:35:31	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Door	Intact	0.1	mg/cm2	NEG
81	12/14/2018	16:35:53	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Door Jamb	Intact	0.6	mg/cm2	NEG
82	12/14/2018	16:37:23	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Door Jamb	Intact	0.5	mg/cm2	NEG
83	12/14/2018	16:38:20	Derdeyn	Waverley ES	1-First	Classroom	White	Concrete	Wall Block	Intact	0.6	mg/cm2	NEG
84	12/14/2018	16:38:43	Derdeyn	Waverley ES	1-First	Classroom	White	Concrete	Wall Block	Intact	0	mg/cm2	NEG
85	12/14/2018	16:39:36	Derdeyn	Waverley ES	1-First	Classroom	White	Concrete	Wall Block	Intact	-0.3	mg/cm2	NEG
86	12/14/2018	16:42:02	Derdeyn	Waverley ES	1-First	Classroom	White	Concrete	Wall Block	Intact	-0.1	mg/cm2	NEG
87	12/14/2018	16:43:12	Derdeyn	Waverley ES	1-First	Classroom	White	Concrete	Wall Block	Intact	-0.3	mg/cm2	NEG
88	12/14/2018	16:44:51	Derdeyn	Waverley ES	1-First	Classroom	Varnish	Wood	Beam	Intact	-0.2	mg/cm2	NEG
89	12/14/2018	16:46:19	Derdeyn	Waverley ES	1-First	Classroom	Varnish	Wood	Door	Intact	-0.2	mg/cm2	NEG
90	12/14/2018	16:47:51	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Handrail	Intact	1.5	mg/cm2	POS
91	12/14/2018	16:48:53	Derdeyn	Waverley ES	1-First	Hall	Red	Metal	Window Casing	Intact	0	mg/cm2	NEG
92	12/14/2018	16:49:40	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Radiator	Intact	0	mg/cm2	NEG
93	12/14/2018	16:51:22	Derdeyn	Waverley ES	1-First	Hall	Varnish	Wood	Coat Rack	Intact	-0.2	mg/cm2	NEG
94	12/14/2018	16:53:22	Derdeyn	Waverley ES	1-First	Classroom	Red	Metal	Window Casing	Intact	0.2	mg/cm2	NEG
95	12/14/2018	16:55:52	Derdeyn	Waverley ES	1-First	Hall	Grey	Metal	Electrical Panel	Intact	0	mg/cm2	NEG
96	12/14/2018	16:56:47	Derdeyn						CALIBRATION		1.1	mg/cm2	POS
97	12/14/2018	16:56:53	Derdeyn						CALIBRATION		1	mg/cm2	POS
98	12/14/2018	16:57:03	Derdeyn						CALIBRATION		1	mg/cm2	POS
99	12/14/2018	16:57:16	Derdeyn						CALIBRATION		-0.1	mg/cm2	NEG
100	12/14/2018	16:57:23	Derdeyn						CALIBRATION		-0.2	mg/cm2	NEG
101	12/14/2018	16:57:31	Derdeyn						CALIBRATION		-0.2	mg/cm2	NEG

APPENDIX F

XRF READING LOCATION DRAWINGS

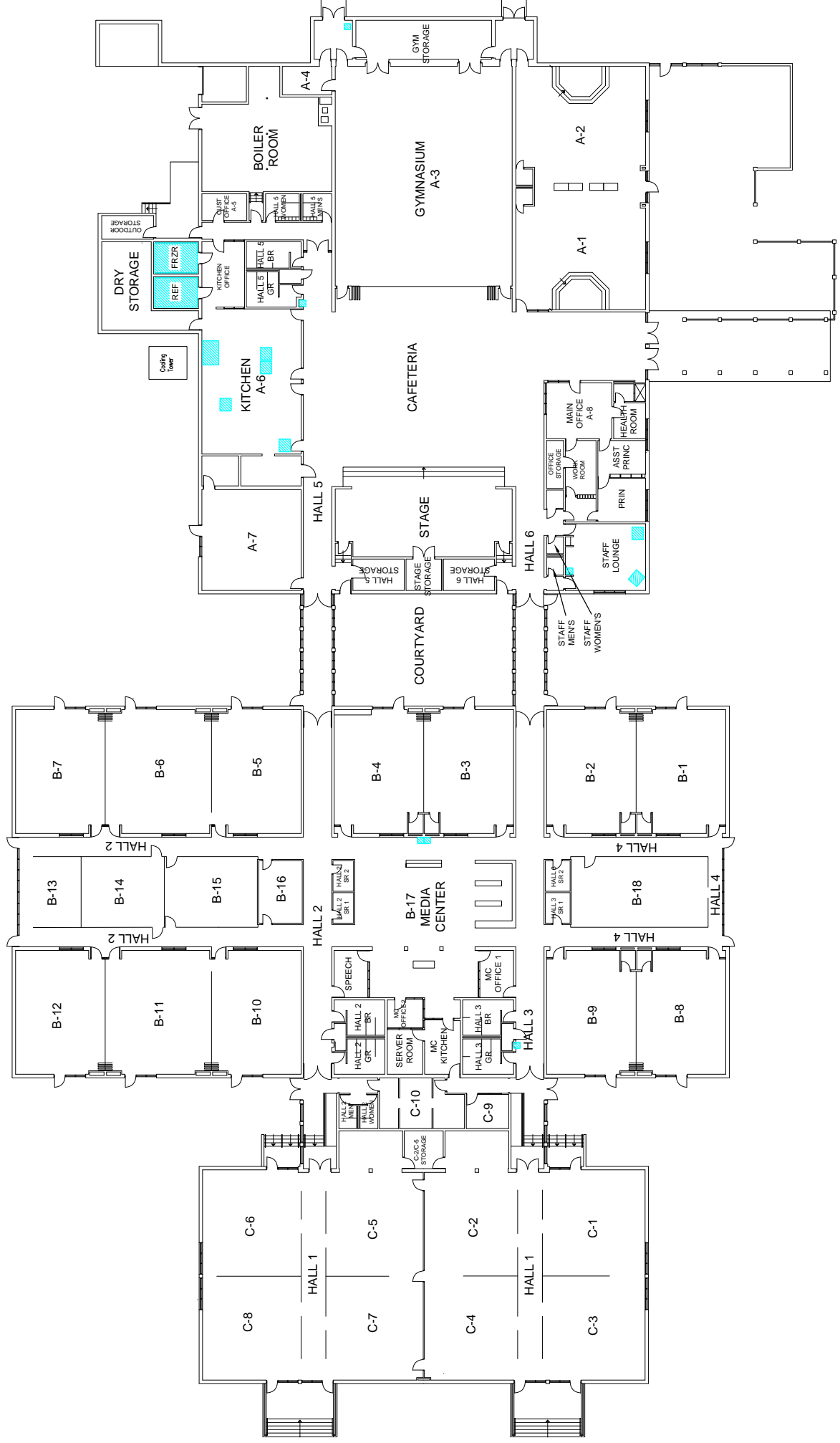
XRF READING LOCATION

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APPENDIX G

FREON[®]-CONTAINING EQUIPMENT LOCATIONS



**FREON-CONTAINING EQUIPMENT
WAYERLEY ELEMENTARY SCHOOL
FREDERICK, MD**

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, and concrete protection.

1.5 ACTION SUBMITTALS

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

- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site to provide the water to cement ratio of the design mix, this must be clearly indicated on EVERY delivery ticket to the Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops and vapor retarder.
- F. LEED Submittals: Comply with Section 01 3329.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For cement, slag, and steel reinforcement: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For products having recycled content (slag and steel): Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For products having regionally sourced recycled material (slag, steel): Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For admixtures and coatings provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and printed statement of VOC content in g/L. Include volume of material applied per product.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.

- B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Field quality-control reports.
- E. Minutes of pre-installation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Store reinforcement in a manner that prevents soil, mud, debris, or oil from adhering to the bars. If for any reason soil, mud, debris, or oil is on a bar it will be removed before the bar is installed.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

- C. Cement: Store to prevent deterioration or contamination. Cement which has become caked, partially set, or otherwise deteriorated, damaged, or contaminated shall not be used.
- D. Aggregates: Store and handle to preserve gradation and cleanliness. Integration of grades and/or contamination are caused for rejection, and such rejected material shall be removed and not used.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 305R and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301
 - 2. ACI 117

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Provide Environmental Product Declarations: Product-specific declaration or Industry-wide EPD or product-specific EPD.
- D. Provide products having recycled content. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- E. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

2.4 REINFORCEMENT ACCESSORIES

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

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C 150, Type I.
 - a. Provide Environmental Product Declarations: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. Fly Ash: ASTM C 618, Class F or C. Use only in concrete mixes for foundation footings, CMU wall grout fills and slab-on-grades.
 3. Slag Cement: ASTM C 989, Grade 100 or 120.
 - a. Provide Environmental Product Declarations: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - b. Provide products having recycled content. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - c. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Nominal Maximum Coarse Aggregate Size: 1 1/2 inch (3/4 inch where placement by pumping) nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330, 1 inch (3/4 inch where placement by pumping) nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Provide Material Ingredient Report. Product-specific declaration or Industry-wide EPD or product-specific EPD.
 1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

- G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C. Provide Material Ingredient Report. Product-specific declaration or Industry-wide EPD or product-specific EPD.
- H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Provide Material Ingredient Report. Product-specific declaration or Industry-wide EPD or product-specific EPD.
- I. Water: ASTM C 94. The water shall be clean, potable, and free from deleterious substances.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: For embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes. Use profile of ribbed surface with center bulb. The waterstop is to be embedded 3 inches into concrete unless noted otherwise on drawings.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Membrane shall not be less than 15 mils thick.
 - 2. Installation shall comply with specification.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Stego Industries, LLC; Stego Wrap 15-mil Class A Vapor Barrier
 - b. Barrier-Bac, Inc.; VB-350 16 mil Class A Vapor Retarder
 - c. W.R. Meadows, Inc.; Sealtight Perminator 15 mil Class A Vapor Retarder
 - d. Insulation Solutions Inc.; Viper VaporCheck 16 mil Class A Vapor Barrier
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel.

2.8 FLOOR AND SLAB TREATMENTS

- A. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, and plasticizing admixture.

2.9 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, according to ASTM D 2240.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.022 inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109.

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 18 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and printed statement of VOC content in g/L. Include volume of material applied per product.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum W/C Ratio: 0.45.

3. Maximum Slump: As indicated.
4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2 to 4 inch slump.
5. Air Content: 6 percent, plus 1 or minus 1.5 percent at point of delivery.

B. Interior Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
4. Maximum Slump: 4 inches.
5. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2 to 4 inch slump.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

C. Suspended Slabs: Lightweight concrete.

1. Minimum Compressive Strength: 3500 psi at 28 days.
2. Calculated Equilibrium Unit Weight: 110 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
3. Slump Limit: 4 inches plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.

- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

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

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

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

3.5 VAPOR-RETARDER INSTALLATION

- A. Vapor Barrier: place, protect, and repair membrane according to ASTM E 1643, ASTM F 710 and manufacturer's written instructions. Contractor shall place the vapor barrier directly below the concrete slab and on top of granular fill. Lap joints 6 inches minimum and seal with manufacturer's recommended tape. Sheets to extend to interior face of foundation walls, turn up vertically and terminate flush with top of concrete floor slab. Adhere to foundation wall with manufacturer's recommended tape. Seal all penetrations with manufacturer's recommended methods of boots, mastic or tape.
- B. Granular Fill: Place a minimum of 4 inches compacted granular fill on top of subgrade to elevation tolerances of plus 0 inch or minus ½ inch.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed ACI347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete. Do not apply rubbed finish to smooth-formed finished concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
 - 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or mortar setting beds for ceramic or quarry tile, Portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraigten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 3. Finish and measure surface, so gap at any point between concrete surface and an unveled, freestanding, 10 feet long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch. In addition, visually obvious faults in floor flatness shall be corrected at contractor's own expense.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 30 cu. yd. or fraction thereof.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory (standard) one set of three standard cylinder specimens for each composite sample. Transport the cylinders to laboratory within 24 hours for final curing and testing
 - b. Cast and field cure one set of two standard cylinder specimens for each composite sample. Field cure the cylinders for the first five (5) days, minimum, in the field under the same conditions as the cast concrete. Transport the cylinders to the laboratory for continued curing and testing.
 7. Compressive-Strength Tests: ASTM C 39; test one laboratory (standard) cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one field cured specimens at 7 days and one at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. If time of concrete strength gain is affected by materials in the mix, such as fly ash, provide correlation information between the 28-day compressive strength and the final compressive strength prior to performing compressive strength tests.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Common brick.
- D. Mortar and grout.
- E. Reinforcement and anchorage.
- F. Flashings.
- G. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- G. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
- H. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- J. ASTM C1506 - Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters.
- K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- L. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- M. ASTM C91/C91M - Standard Specification for Masonry Cement.

- N. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- O. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
- P. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement.
- R. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- S. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale).
- T. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- U. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- V. ASTM C476 - Standard Specification for Grout for Masonry.
- W. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- X. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- Y. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.
- Z. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.
- AA. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- AB. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- AC. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- AD. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- AE. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- AF. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.
- AG. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.
- AH. NCMA TEK 8-2A - Removal of Stains from Concrete Masonry.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting 7 days before starting work of this section; require attendance by all relevant installers.

1.4 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Reporting - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For cement, CMU, and steel reinforcement: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For products having recycled content (CMU and steel): Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For products having regionally sourced recycled material (CMU and steel): Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For CMU and brick provide Material Ingredient Report.**
- C. Shop Drawings: Indicate sizes and profiles of special shapes, and detail bending, lap lengths and locations of reinforcing steel.
- D. Samples: Submit four samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range. Submit two samples of colored mortar per selection.
- E. Sample Panels for Initial Selection: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction (including Brick Masonry, Concrete Masonry Units, and Decorative/Ground Face Concrete Masonry Units) in sizes approximately 60 inches (1500 mm) long by 48 inches (1200 mm) high by full thickness.
 - a. Build sample panels for each pairing of Brick Masonry described below, as well as for each type of Concrete Masonry Unit (including all products listed in ground face/decorative "Available Products"). Architect and Owner shall select brick masonry and ground face/decorative concrete unit masonry material after sample panels are constructed. Coordinate timing of construction of sample panels with Construction Manager to ensure timely delivery of material for all masonry construction.
 - b. Build sample panels in a location that can remain undisturbed until Mockup panels are fully constructed. Build sample panels in a location facing east in which all panels receive identical sunlight conditions at the same time between 9 AM and 11 AM (without shadowing on some panels) so that materials can be evaluated in identical lighting conditions.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Samples for Verification: For each type and color of the following:

1. Special brick shapes.
- G. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- I. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.
 1. Maintain one copy of each document on project site.
- B. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.6 MOCK-UP

- A. Build mock-ups to verify initial selections and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build a mock-up with each type of exposed unit masonry assembly by full thickness in order to demonstrate inside and outside corners.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in mockup.
 - b. Include window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include all components associated with the specified cavity walls; including but not limited to vertical reinforcement, insulation, water-proofing, ties, anchors, flashing, sealant, mortar, and weeps.
 2. Clean exposed faces of mock-ups with masonry cleaner as indicated.
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Mock-ups will not be demolished or moved prior to issuance of substantial completion.
 5. Approval of mock-ups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mock-ups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

- B. Locate where directed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Recycled Content: Provide CMU products with recycled content. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Provide regionally sourced recycled material. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.**
 - 4. **Provide Material Ingredient Report.**
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for corners, jambs, sashes, movement joints, headers, bonding, and other locations as indicated on drawings.
 - 2. For sills, caps, and similar applications that would otherwise expose unfinished surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 3. Provide bullnose units for outside corners of exposed interior CMUs unless otherwise indicated.
- C. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - 3. Non-Loadbearing Units: ASTM C129.
 - a. Lightweight.
- D. Decorative CMUs: ASTM C90
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Non-Loadbearing Units: ASTM C129:

- a. Lightweight
- 3. Decorative CMU Schedule: Provide pricing for the following groupings:
 - a. Base Bid Manufacturer: Westbrook Concrete Block Company, Inc..
 - 1) 042000-C1: Ground Face, GF-179.
 - 2) 042000-C2: Ground Face, GF-135.

2.3 BRICK UNITS

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**
- C. Facing Brick: ASTM C216, Type FBX, Grade SW, unless noted otherwise.
 - 1. Nominal size: As indicated on drawings.
 - 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
- D. Brick Schedule: Provide pricing for the following groupings:
 - 1. Base Bid Manufacturer: Varies.
 - a. 042000-B1: Yankee Hill Brick & Tile, Metro Ironspot Velour.
 - b. 042000-B2: Glen Gery, Stone Grey, K12-3009.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
 - 1. Colored Mortar: To match Architect's sample(s).
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredient
- D. Mortar Aggregate: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- E. Grout Aggregate: ASTM C404.
- F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

- G. Water: Clean and potable.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.5 REINFORCEMENT AND ANCHORAGE

- A. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- C. Masonry Joint Reinforcement, General: ASTM A951/A951M.
- D. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
 - 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
 - 3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
 - 4. Vertical adjustment: Not more than 1 1/4 inches.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
- G. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.
- H. Masonry Veneer Anchors: 2-piece, thermally-broken anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 2. Vertical adjustment: Not less than 3-1/2 inches.
 - 3. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

- I. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.6 FLASHINGS

- A. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
- B. Factory-Fabricated Flashing Corners and Ends: Stainless steel.
- C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
- D. Termination Bars: Stainless steel; compatible with membrane and adhesives.
- E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.
- F. Locations:
 - 1. Exterior door heads.
 - 2. Window heads and sills.
 - 3. Storefront and curtain wall heads.
 - 4. Horizontal control joints.
 - 5. Changes in veneer materials, vertically.
 - 6. Other wall openings.
 - 7. Other locations indicated.

2.7 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane .
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
- E. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226/D226M, Type I ("No.15" asphalt felt).
- F. Weeps:
 - 1. Type: Polyester mesh.
 - 2. Size: 3 1/2" x 3 1/2" (sized for larger brick).
 - 3. Color: As selected by Architect from manufacturer's full range.

- G. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in place. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. Use manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.8 MORTAR AND GROUT MIXES

- A. **LEED Credit MR 5: Subject to compliance with requirements, provide materials that have been extracted, harvested or recovered, and manufactured within 500 miles of Project site.**
- B. Mortar for Unit Masonry: ASTM C270, using the Property Specification.
 - 1. Masonry below grade and in contact with earth: Type M.
 - 2. Exterior, loadbearing masonry: Type S.
 - 3. Exterior, non-loadbearing masonry veneer: Type N.
 - 4. Interior, loadbearing masonry: Type S.
 - 5. Interior, non-loadbearing masonry: Type S.
- C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
 - 1. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Face brick.
- D. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2. for specified 28-day compressive strength indicated, but no less than 3000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C143/C143M.
- E. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- F. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.

- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.4 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running unless otherwise indicated.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.7 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement not more than 8 inches on center in foundation walls and parapet walls.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.9 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- C. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.10 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
 - 1. Anchor vertical leg of flashing into backing with a termination bar and sealant.
- C. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel flat drip with hemmed edge.
- D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Allow masonry lintels to attain specified strength before removing temporary supports.

3.12 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joints in brick as detailed on drawings.
- E. Provide bond-breaker strip and sealant joint at all horizontal reveal locations. Break should occur between dissimilar masonry types.

3.13 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage and pay for special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to the International Building Code and the inspection tables indicated on the structural drawings.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, laps, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
 - 4. Inspect all masonry vertical reinforcement.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 1500 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 7. Clean stone trim to comply with stone supplier's written instructions.

3.17 PROTECTION

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
 2. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
 3. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. LEED Submittals: Comply with Section 01 3329.
 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For steel: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel, if applicable: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
 7. Structural steel including chemical and physical properties.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.

- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, M-Shapes: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.
 - 1. Weight Class: As required by design.
 - 2. Finish: As indicated.
- F. Steel Castings: ASTM A 216, Grade WCB with supplementary requirement S11.
- G. Steel Forgings: ASTM A 668.
- H. Welding Electrodes: Comply with AWS requirements.
- I. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
- J. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
 - 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All Other Steel Materials: Minimum 30 percent total recycled content.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: As indicated.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36 carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.

5. Finish: Plain.

D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

E. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

G. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting".
- B. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
- C. Primer: SSPC-Paint 25 BCS, Type II, zinc oxide, alkyd, linseed oil primer.
- D. Primer: SSPC-Paint 23, latex primer.
- E. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- F. Galvanizing Repair Paint: ASTM A 780.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
- H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1 and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.

2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: As indicated.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1.
1. In addition to visual inspection, test and inspect field welds according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 05 1213 - ARCHITECTURALLY-EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

1.2 RELATED REQUIREMENTS

- A. Section 05 1200 - Structural Steel Framing: General requirements for structural steel members, including AESS framing specified in this section.
- B. Section 09 9113 - Exterior Painting: Finish coat requirements and coordination with primer and surface preparation specified in this section.
- C. Section 09 9600 - High-Performance Coatings: Finish coat requirements and coordination with primer and surface preparation specified in this section.

1.3 DEFINITIONS

- A. Architecturally-Exposed Structural Steel: Structural steel complying with designated AESS category as defined in AISC 303.

1.4 REFERENCE STANDARDS

- A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- G. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Schedule and conduct a preinstallation meeting at project site one week prior to start of work of this section; require attendance by all affected installers. Coordinate

requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch-up painting, mock-up coordination, Architect's observations, and other requirements for AESS.

1.6 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product data for each type of product specified. Submit paint systems in accordance with Section 09 9600.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4.**
 - 1. **MR 2: BPDO - Environmental Product Declarations**
 - a. **For steel: Product-specific declaration or Industry-wide EPD or product-specific EPD.**
 - 2. **MR 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For regionally sourced steel, if applicable: Documentation indicating locations of recovery, manufacture, and purchase of recycled raw materials.**
- D. Shop Drawings: Detailing for fabrication of AESS components.
 - 1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.
 - 2. Include details that clearly identify AESS requirements found in this specification. Provide connections for AESS consistent with concepts shown on drawings.
 - 3. Indicate welds by AWS A2.4 symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined by the designated AESS category.
- E. AESS 1 and AESS 2 Samples: Provide samples of specific AESS characteristics. Samples may be small size samples or components of conventional structural steel demonstrating specific AESS characteristics, including surface preparation, sharp edges ground smooth, continuous weld appearance, weld show through, and fabrication mark removal.
- F. Qualification data for fabricator and erector to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, photographs showing detail of installed AESS, and other information specified.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Section 05 1200, engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the work.
- B. Erector Qualifications: In addition to those qualifications listed in Section 05 1200, engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

1.8 MOCK-UP

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Locate mock-ups on site. Mock-ups to be full-size unless Architect approves smaller models. Alternatively, when a mock-up is not practical, the first piece of an element or connection can be used to determine acceptability.
- C. Notify Architect one week in advance of dates and times when mock-ups will be available for review.
- D. Demonstrate applicable AESS characteristics for specified category of AESS on elements and joints in mock-up.
- E. Build mock-ups using member sizes and materials indicated for final work.
- F. Mock-up to demonstrate weld quality, contouring of welds at aligned walls of members, specified surface preparation, and finish coating.
- G. Obtain Architect's written approval of mock-ups before starting fabrication.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handle finished pieces in accordance with Section 10 of AISC 303, using nylon-type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Comply with Section 05 1200, except as amended in this section for aesthetic purposes.
- B. Comply with AISC 303, Section 10 for specific AESS category designated on drawings.
- C. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:**
 - a. **Plate and Bar: Minimum 30 percent total recycled content.**
 - b. **Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.**
 - c. **Steel Pipe: Minimum 30 percent total recycled content.**
 - d. **All Other Steel Materials: Minimum 30 percent total recycled content.**

2.2 FABRICATION

- A. Fabricate and assemble AESS in shop to greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Architect. Detail AESS assemblies to minimize field handling and expedite erection.
 - 1. Exposed surfaces shall be smooth, square and free of:
 - a. surface blemishes including pitting, rust, scale and roughness.
 - b. mill marks including rolled trade names and stamped or raised identification.
 - c. seams to the maximum extent possible.
 - 2. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and edges.
 - 3. Remove blemishes by filling or grinding, or by welding and grinding, before cleaning, treating and shop priming.
 - 4. Piece marks shall be fully hidden in the completed structure or made with media that permits full removal upon erection.
 - 5. Seal-weld open ends of hollow structural sections with 3/8" (9.5 mm) closure plates.
- B. Permissible tolerances for member depth, width, out of square, and camber and sweep to be as specified in ASTM A6/A6M, ASTM A500/A500M, and ASTM A1085/A1085M.
- C. Use special care in handling and shipping of AESS both before and after shop painting to minimize damage to any shop finish. Use nylon-type slings or softeners when using chains or wire rope slings.
- D. Bolted Connections:
 - 1. Make in accordance with Section 05 1200. Provide bolt type and finish as noted herein.
- E. Surface Preparation:
 - 1. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 - 2. Remove backing and run out tabs.
- F. Fabricate AESS in accordance with categories defined in AISC 303, as follows:
 - 1. AESS 1: Basic elements.
 - 2. AESS 2: Feature elements viewed at a distance greater than 20 feet (feature elements not in close view).

2.3 PAINT SYSTEM

- A. Compatibility: All components/procedures of AESS paint system to comply with coating system specified, submitted, and approved per Section 09 9600. As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating, and finish coating to be from a single manufacturer combined in a system documented by manufacturer with adequate guidance for fabricator to procure and execute.
- B. Primer: As specified in Section 09 9600. Primer to comply with all federal standards for VOC, lead and chromate levels.
- C. Finish Coating: Field apply intermediate and top coats per Section 09 9600.

2.4 SHOP PRIMING

- A. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted with slip-critical connections.

- B. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by hot-dip process to AESS indicated for galvanizing according to ASTM A123/A123M. Fabricate such that all connections of assemblies are made in the field with bolted connections where possible.

2.6 MATERIALS

- A. General: Meet requirements of 05 1200 as amended below.

2.7 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 - 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 1200 for additional requirements.
- C. AESS 1 and 2 Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erector to check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of appearance of member. Coordinate remedial action with fabricator prior to erecting steel.

3.2 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on approved fabrication documents. Temporary connections not shown are to be made at locations not exposed to view in final structure or as approved by Architect.
- B. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain appearance of AESS through process of erection.

3.3 ERECTION

- A. AESS 1 and 2: Basic elements; feature elements not in close view:
 - 1. Employ special care to handle and erect AESS. Erect finished pieces using nylon straps or chains with softeners such that they are not damaged.
 - 2. Place weld tabs for temporary bracing and safety cabling at points concealed from view in completed structure or where approved by Architect during pre-installation meeting.

Obtain Architect approval of methods for removing temporary devices and finishing AESS members prior to erection.

3. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of AISC 303.
4. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
5. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
6. Remove all backing and run out tabs.
7. When temporary braces or fixtures are required to facilitate erection, take care to avoid any blemishes, holes or unsightly surfaces resulting from use or removal of such temporary elements.
8. Bolted Connections: Align bolt heads on same side of connection as indicated on approved fabrication or erection documents.
9. Welded Connections: Comply with AWS D1.1/D1.1M and Section 05 1200. Appearance and quality of welds to be consistent. Employ methods that will maintain alignment of members without warp exceeding tolerance of this section.
10. Remove weld spatter exposed to view.
11. Grind off projections larger than 1/16 inch at field butt and plug welds.
12. Continuous Welds: Where continuous welding is noted on drawings, provide continuous welds of a uniform size and profile.
13. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
14. Splice members only where indicated.
15. Obtain permission for any torch cutting or field fabrication from Architect. Finish sections thermally cut during erection to a surface appearance consistent with mock-up.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 1200 for additional requirements.
- C. AESS 1 and 2 Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

3.5 CLEANING

- A. Touch-up Painting: Complete cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint to blend with adjacent surfaces of AESS. Perform touch-up work in accordance with manufacturer's instructions and as specified in Section 09 9113 and 09 9600.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas. Repair galvanized surfaces in accordance with ASTM A780/A780M.
- C. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 05 2100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. K-series steel joist substitutes.
 - 3. LH- and DLH-series long-span steel joists.
 - 4. Joist accessories.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.
- C. LEED Submittals: Comply with Section 01 3329.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For steel: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel, if applicable: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications".
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications".
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Floor Joists: Vertical deflection of 1/240 (total load) of the span.
 - b. Roof Joists: Vertical deflection of 1/240 (total load) of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications".
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.
- H. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
- I. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
 - 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All Other Steel Materials: Minimum 30 percent total recycled content.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
 - 1. Joist Type: LH-series steel joists and DLH-series steel joists.
 - 2. End Arrangement: Underslung.
 - 3. Top-Chord Arrangement: As indicated.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber long-span steel joists according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

- E. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows:
 - 1. Plate and Bar: Minimum 30 percent total recycled content.
 - 2. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - 3. Steel Pipe: Minimum 30 percent total recycled content.
 - 4. All Other Steel Materials: Minimum 30 percent total recycled content.

2.4 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Detail and fabricate according to SJI's "Specifications". Furnish additional erection bridging if required for stability.
- C. Fabricate steel bearing plates from ASTM A 36 steel with integral anchorages of sizes and thicknesses indicated.
- D. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."
- E. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
 - 1. Finish: Plain, uncoated.
- F. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- G. Welding Electrodes: Comply with AWS standards.
- H. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- I. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
- D. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting". Section 099600 "High-Performance Coatings".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications", joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds according to AWS D1.1.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1 and the following procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting". Section 099600 "High-Performance Coatings".
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 05 3100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Acoustical cellular roof deck.
 - 3. Composite floor deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. LEED Submittals: Comply with Section 01 3329.
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For steel: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
 - 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck, from ICC-ES.

- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 - 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.

3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33 G90 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
4. Deck Profile: As indicated.
5. Profile Depth: As indicated.
6. Design Uncoated-Steel Thickness: As indicated.
7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
8. Span Condition: As indicated.
9. Side Laps: Overlapped or interlocking seam at Contractor's option.
10. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
11. Recycled Content: Provide steel with minimum 50 percent total recycled content including at least 25 percent post-consumer recycled content.
12. Regional Materials: If necessary to meet required LEED threshold, provide steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

2.3 ACOUSTICAL ROOF DECK

- A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 4. Deck Profile: As indicated.
 5. Cellular Deck Profile: As indicated, with bottom plate.
 6. Profile Depth: As indicated.
 7. Design Uncoated-Steel Thickness: As indicated.
 8. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 9. Span Condition: As indicated.
 10. Side Laps: Overlapped or interlocking seam at Contractor's option.
 11. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
 12. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 - a. Factory install sound-absorbing insulation into cells of cellular deck.
 - b. Installation of sound-absorbing insulation is specified.

13. Acoustical Performance: As indicated, tested according to ASTM C423.
14. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
15. Recycled Content: Provide steel with minimum 50 percent total recycled content including at least 25 percent post-consumer recycled content.
16. Regional Materials: If necessary to meet required LEED threshold, provide steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

2.4 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 50 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray baked-on, rust-inhibitive primer.
 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G60 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.
 4. Profile Depth: As indicated.
 5. Design Uncoated-Steel Thickness: As indicated.
 6. Span Condition: As indicated.
 7. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 8. Recycled Content: Provide steel with minimum 50 percent total recycled content including at least 25 percent post-consumer recycled content.
 9. Regional Materials: If necessary to meet required LEED threshold, provide steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: ASTM A 780.
- M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zeos in ribs to span between supports and weld or mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds as indicated.
 - 3. Weld Spacing: Space and locate welds as indicated.
 - 4. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.
- F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 053100

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.
 - 3. Ceiling joist framing.
 - 4. Soffit framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.
- D. LEED Submittals: Comply with Section 01 3329.
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - 2. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. For regionally sourced steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- E. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated on Drawings.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 (flexible finishes) or 1/600 (brittle finishes) of the wall height.
 - b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch.
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 33 for minimum uncoated steel thickness of 0.0428 inch and less; 50 for minimum uncoated steel thickness of 0.0538 inch and greater.
 2. Coating: G60.
 3. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
 4. Regional Materials: Provide steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance.
 2. Flange Width: 1-5/8 inches, minimum.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.

- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
 - 2. Inner Track: Of web depth indicated.
- F. head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches, minimum.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
 - 2. Inner Track: Of web depth indicated.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.6 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole-reinforcing plates.
 - 11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5, unless otherwise indicated.

- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

- a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
 - 2. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing and/or infill studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
- 3.5 INTERIOR NON-LOAD-BEARING WALL INSTALLATION
- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
1. Stud Spacing: As indicated.
 2. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to studs and anchor to building structure.
 4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
1. Install solid blocking at centers indicated on Shop Drawings.

- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.8 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Prefabricated ladders and ship ladders.

1.2 REFERENCE STANDARDS

- A. 29 CFR 1910.28 - Duty to have Fall Protection and Falling Object Protection.
- B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices.
- C. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- D. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- K. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- L. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- M. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
- N. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- O. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- P. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

- Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- R. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- S. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- T. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- U. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- V. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- W. SSPC-SP 2 - Hand Tool Cleaning.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gages.
 - 4) Details of connections.
 - 5) Support reactions.
 - 6) Bracing requirements.
- D. Certificate: Provide documentation that ladder safety system products of this section meet or exceed cited 29 CFR 1910.28, 29 CFR 1910.29, ANSI/ASSP Z359.16, and ANSI A14.3 requirements.
- E. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- F. Designer's Qualification Statement.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4 QUALITY ASSURANCE

- A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- I. **Sustainable Design Requirements:**
 - 1. **Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.**

2.2 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
- D. Bolts, Nuts, and Washers: Stainless steel.
- E. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.3 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
 - 1. Industrial type: As shown on the drawings.
 - 2. Architectural type: Provide decorative plastic sleeve.
 - a. Manufacturers:
 - 1) IdealShield; Skyline: www.idealsheild.com/.
 - 2) Innoplast; Black Slant Top: www.innoplast.com/.
 - b. Color: As selected by Architect from manufacturers custom range.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; galvanized finish.
- C. Lintels: As detailed; prime paint finish.
- D. Door Frames for Overhead Door Openings: Channel sections; galvanized finish.
- E. Recessed Mat Frames : As detailed; aluminum, mill finish.
- F. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.
- G. Elevator Threshold Support Members: Angle sections; prime paint finish.
- H. Support Members for Curtainwall and Storefront Framing: Galvanized finish.
- I. Support Members for Platform/Stage Equipment: prime paint finish.

2.5 PREFABRICATED LADDERS

- A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
 - 3. Finish: Mill finish aluminum.
 - 4. Manufacturers:
 - a. Industrial Ladder & Scaffolding, Inc.; ALACCRH, ALACCB: www.anyladder.com/#sle.
 - b. O'Keeffe's Inc; Model 500, Model 504: www.okeeffes.com/#sle.
 - c. Alaco Ladder Company; Model 560, Model 561, Model 561-E.

2.6 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for Architecturally-Exposed Structural Steel (AESS) finish.

- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.7 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100 - METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Prefabricated stair treads and nosings.

1.2 REFERENCE STANDARDS

- A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- F. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- I. SSPC-SP 2 - Hand Tool Cleaning.

1.3 SUBMITTALS

- A. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Reporting - LEED v4/v4.1.**
 - 1. **MR Credit 3: BDPO - Sourcing of Raw Materials**
 - a. **For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Welders' Certificates.
- E. Designer's Qualification Statement.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.4 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Fabricator Qualifications:
 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.1 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
 4. Dimensions: As indicated on drawings.
 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 1. For stairs open to adjacent spaces and not enclosed by surrounding walls, comply with the requirements indicated below and in Section 05 1213.
 2. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

3. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
 - a. Welded Joints: Welded on back side wherever possible.
 - b. Welds Exposed to View: Ground smooth; not required to be flush.
 - c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
 - d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.
- E. **Sustainable Design Requirements:**
 1. **Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.**

2.2 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
 1. Service Quality Jointing and Finishing for stairs used by maintenance staff and off limits from the general public; architectural quality at all other locations.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
 1. Concrete Depth: 1-1/2 inches, minimum.
 2. Tread Pan Material: Steel sheet.
 3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
 4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
 5. Concrete Reinforcement: None.
 6. Concrete Finish: For fluid-applied resinous flooring.
- D. Risers: Same material and thickness as tread pans.
 1. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
 2. Nosing Depth: Not more than 1-1/2 inch overhang.
 3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
 1. Stringer Depth: 10 inches.
 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Similar construction, using corrugated steel decking, supported and reinforced as required to achieve design load capacity.
- G. Finish: Shop- or factory-prime painted.
- H. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.3 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: As specified in Section 05 5213.

- B. Guards: Pipe railings as specified in Section 05 5213.

2.4 MATERIALS

- A. **Recycled Content: Provide steel with 25 percent, minimum, total recycled content including at least 10 percent post-consumer recycled content.**
- B. Steel Sections: ASTM A 36/A 36M.
- C. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- D. Concrete Fill: Type specified in Section 03 3000.

2.5 ACCESSORIES

- A. Factory Fabricated Stair Tread and Nosing:
 - 1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
 - a. Tread Type: Ribbed bar.
- B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.6 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 - 1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
 - 2. Number of Coats: One.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.
- D. Balcony railings and guardrails.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 SUBMITTALS

- A. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/4.1.**
 - 1. **MR 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.

- C. Designer's Qualification Statement.
- D. Fabricator's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Rail Infill, where indicated on the drawings:
 - 1. McNICHOLS; Wire Mesh: www.mcnichols.com/.
 - 2. Banker Wire; Ornamental Welded Wire Mesh: www.bankerwire.com/.
 - 3. Edward J. Darby & Son; Welded Wire Mesh: www.darbywiremesh.com/.

2.2 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
 - 1. Posts: 1-1/2 inches diameter, round.
 - 2. Balusters: 1/2 inch square solid bar.
 - 3. Infill: Wire mesh, where indicated.
- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.3 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- G. **Sustainable Design Requirements:**
 - 1. **Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.**

2.4 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rough opening framing for doors, windows, and roof openings.
- B. Roofing cant strips.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Miscellaneous framing and sheathing.
- F. Communications and electrical room mounting boards.
- G. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. AWWA U1 - Use Category System: User Specification for Treated Wood.
- F. PS 1 - Structural Plywood.
- G. PS 20 - American Softwood Lumber Standard.
- H. SPIB (GR) - Grading Rules.

1.3 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials and application instructions.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC Chain-of-Custody (CoC) certificates.**

2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For treated wood provide Material Ingredient Report.**
3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and VOC content in g/L. Include volume of material applied per product.**
 - b. **For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.**

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 1. Species: Southern Pine, unless otherwise indicated.
 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.
- C. **Sustainable Design Requirements:**
 1. **Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.**
 2. **For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and VOC content in g/L. Include volume of material applied per product.**
 3. **For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.**

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

- A. Wall Sheathing, For Exterior Walls, at locations indicated on the drawings: Plywood, PS 1, Grade C-C, Exterior Exposure.
- B. Wall Sheathing, For Exterior Walls, unless noted otherwise: Glass mat faced gypsum, ASTM C1177/C1177M, 1/2 inch.
 - 1. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly.
 - 2. Manufacturers:
 - a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Water-Resistive Barrier: As specified in Section 07 2500.

2.5 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.

2. Interior Type A: AWP A U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 1. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.
 - 10. Exterior and Interior Signage.
 - 11. Electronic Displays.

3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.5 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.6 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Cabinet hardware.

1.2 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program, www.awiqcp.org.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association (ANSI/BHMA A156.9).
- D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For composite wood and plastic finishes provide Material Ingredient Report.**
 - 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**

- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
 - 2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
- D. Product Data: Provide data for hardware accessories.
- E. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and shelf unit substrate and finish.
- F. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification: Provide AWI Quality Certification Program inspection report and quality certification of completed work.
 - 1. Provide labels or certificates indicating that the work complies with requirements of AWS Grade or Grades specified.
 - 2. This project has been registered as AWI/QCP project number _____.
 - 3. Prior to delivery to the site provide shop drawings with certification labels.
 - 4. Provide labels on each product when required by certification program.
 - 5. Upon completion of installation provide certificate certifying that the installation and products meet the specified requirements.
 - 6. Arrange and pay for inspections required for certification.
 - 7. Replace, repair, or rework all work for which certification is refused.
- C. Quality Expectations: Materials must be designed, constructed and installed to meet the intended use and expected abuse to be incurred within the educational environment. This specification outlines the minimum requirements for material quality, construction, finish and overall workmanship to be provided. The finished products shall be functional, have an extended life expectancy with minimal maintenance and be operationally safe.

1.6 MOCK-UP

- A. Provide mock-up of typical base cabinet and wall cabinet, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.8 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Custom Grade.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets :
 - 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 - 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 3. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
 - 4. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
 - 5. Adjustable Shelf Loading: 50 lbs. per sq. ft..
 - 6. Cabinet Style: Flush overlay.
 - 7. Cabinet Doors and Drawer Fronts: Flush style.
 - 8. Drawer Side Construction: Multiple-dovetailed.
 - 9. Drawer Construction Technique: Dovetail joints.

2.2 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Sustainable Design Requirements:
 - 1. **Forest Certification: Provide wood products harvested from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.**
 - 2. **Compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**
 - 3. **Composite Wood:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**

2.3 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation: www.formica.com.
 - 2. Panolam Industries International, Inc\Nevamar: www.nevamar.com.
 - 3. Wilsonart International, Inc: www.wilsonart.com.

- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.4 ACCESSORIES

- A. Adhesive: Type recommended by AWI/AWMAC to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Architect from manufacturer's custom range.
- C. Fasteners: Size and type to suit application.
- D. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.5 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.
- D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
 - 1. Individual rooms to be keyed alike.
- E. Hinges: European style concealed self-closing type, steel with polished finish.

2.6 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Cap exposed plastic laminate finish edges with plastic trim.
- E. Provide cutouts for all penetrations. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.7 SHOP FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

- A. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 8316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.2 REFERENCE STANDARDS

- A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Samples: Submit two samples 4 x 4 inch in size illustrating material and surface design of panels.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Crane Composites, Inc; Glasbord: www.cranecomposites.com/#sle.
 - 2. Marlite, Inc; Standard FRP: www.marlite.com/#sle.
 - 3. Nudo Products, Inc; FiberLite FRP: www.nudo.com/#sle.

2.2 PANEL SYSTEMS

- A. Wall Panels at Janitorial Closets:
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.10 inch.
 - 3. Surface Design: Embossed.
 - 4. Color: As selected by Architect.
 - 5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.3 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- B. Trim: Vinyl; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; color matching panel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.2 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 0553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- B. Schedule: Completely define scope of proposed marking. Indicate location of affected walls and partitions, and number of markings.
- C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 FIELD CONDITIONS

- A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 9123 for products.
- C. Languages: Provide all markings in English and Spanish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

- A. See Section 09 9123 for substrate preparation for painted markings.

3.3 INSTALLATION

- A. Locate markings as required by ICC (IBC).
- B. Install applied markings in accordance with Section 09 9123.
- C. Install neatly, with horizontal edges level.
- D. Protect from damage until Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 1400 - FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-Applied Waterproofing:
 - 1. Cold-applied modified-polymer elastomeric waterproofing.

1.2 REFERENCE STANDARDS

- A. ASTM D5957 - Standard Guide for Flood Testing Horizontal Waterproofing Installations.
- B. ASTM D7877 - Standard Guide For Electronic Methods For Detecting And Locating Leaks In Waterproof Membranes; 2014.

1.3 SUBMITTALS

- A. Product Data: Provide data for membrane and accessories. Include confirmation that product(s) are compatible with adjacent materials for proposed use.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR 4: BPDO - Material Ingredients**
 - a. **For waterproofing: Material Ingredient Report.**
- C. Shop Drawings: Indicate project-specific special joint or termination conditions and conditions of interface with other materials on a location diagram; provide details. Include a letter from the product manufacturer indicating that the project-specific details have been reviewed and approved for use.
- D. Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Warranty:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's certification that installation complies with warranty conditions for the waterproofing membrane.
- G. Construction Checklists: Provide documentation included with Section 01 9119 - Building Envelope Commissioning to verify visual inspection of substrates prior to application, manufacturer's wet film thickness of installed work, adhesion test as field quality control, and visual inspection of the completed system with any corrected deficiencies.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

- B. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 MOCK-UP

- A. Construct mock-up consisting of 36 sq ft, minimum, of vertical waterproofed panel; to represent finished work including internal and external corners, control joints, expansion joints, and protective cover.
- B. Locate where directed.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

1.7 WARRANTY

- A. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no cost to Owner.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.1 WATERPROOFING APPLICATIONS

- A. Cold-Applied Modified-Polymer Elastomeric Waterproofing:
 - 1. Location: Exterior face of below grade masonry foundation walls.
 - 2. Cover with protection board.

2.2 FLUID APPLIED WATERPROOFING MATERIALS

- A. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**
- B. Cold-Applied Modified-Polymer Elastomeric Waterproofing:
 - 1. Cured Thickness: 60 mils, 0.060 inch, minimum.
 - 2. Suitable for installation over concrete substrates.
 - 3. Products:
 - a. Carlisle Coatings & Waterproofing, Inc; MiraSEAL: www.carlisleccw.com/#sle.
 - b. Henry Company; Henry CM100: www.henry.com/#sle.
 - c. W.R. Meadows, Inc; HYDRALASTIC 836: www.wrmeadows.com/#sle.
- C. Joint Cover Sheet: 1 inch thick elastic sheet material designated for and compatible with membrane.

2.3 ACCESSORIES

- A. Surface Conditioner: Type to be determined by adhesion test to adjacent substrates and compatibility with membrane compound; as recommended by membrane manufacturer.
- B. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.
- C. Protection Board: Rigid insulation specified in Section 07 2100.
- D. Cant Strips: Premolded composition material.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system per manufacturer's recommendations.
- C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials per manufacturer's recommendations.
- D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Installation of product indicates acceptance of substrate conditions.
- C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.
- D. Fill non-moving joints and cracks with a filler compatible with waterproofing materials.
- E. Seal moving cracks with sealant and non-rigid filler, using procedures recommended by sealant and waterproofing manufacturers.
- F. Install cant strips at inside corners.

3.3 INSTALLATION

- A. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.
- B. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions applicable requirements.
- C. At joints and cracks less than 1/2 inch in width including joints between horizontal and vertical surfaces, apply 12 inch wide strip of joint cover sheet.

- D. Center joint cover sheet over joints, roll sheet into 1/8 inch thick coating of waterproofing material and apply second coat over sheet extending at least 6 inches beyond sheet edges.
- E. Extend membrane over cants and up intersecting surfaces at membrane perimeter minimum 6 inches above horizontal surface for first ply and 6 inches at subsequent plies laid in shingle fashion.
- F. Seal membrane and flashings to adjoining surfaces.
 - 1. Install termination bar along edges.

3.4 INSTALLATION - PROTECTION BOARD

- A. After membrane has cured, but before it becomes dusty, apply separation sheet and lap joints to ensure complete coverage.
- B. Place protection board directly against cured membrane; butt joints, and scribe and cut boards around projections, penetrations, and interruptions.

3.5 FIELD QUALITY CONTROL

- A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; and application of membrane, flashings, protection, and drainage components; furnish daily reports to Architect.
 - 1. Site representative shall measure membrane thickness with pin tester or other suitable device at least once for every 100 sq. ft. (10 sq. m) and include measurements in reports.
- B. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect.
 - 1. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D5957, or perform Electric Leak Detection (ELD) testing, after completing and protecting waterproofing but before overlaying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water. Testing agency shall observe flood testing.
 - a. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of sheet flashings.
 - b. Flood each area for 24 hours.
 - c. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.
 - 2. Electric Leak Detection (ELD): Testing agency shall survey entire waterproofing area for potential leaks per ASTM D7877.

3.6 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.

1.2 RELATED REQUIREMENTS

- A. Section 01 9119 - Building Envelope Commissioning: Supplemental installation requirements for board insulation pertaining to objectives and criteria of the building enclosure system.

1.3 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations. Include confirmation that product(s) are compatible with adjacent materials for proposed use.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For insulation: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For manufacturers with extended producer responsibility programs: Documentation describing the program and confirmation that product is included in the program.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For insulation: Material Ingredient Report.**
 - 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.**

- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.
- F. Construction Checklists: Provide documentation included with Section 01 9119 - Building Envelope Commissioning to verify visual inspection of substrates prior to application, fastening pattern and visual inspection of the completed system with any corrected deficiencies.

1.5 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.
- B. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.6 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Mineral fiber board.
- B. Insulation Inside Masonry Cavity Walls: Mineral fiber board.
- C. Insulation Over Metal Stud Framed Walls, Continuous: Mineral fiber board.

2.2 FIBERBOARD INSULATION MATERIALS

- A. Mineral Fiberboard Insulation: Rigid or semi-rigid mineral fiber, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 - 1. Board Size: 16 by 48 inches.
 - 2. Thermal Resistance: R-value of 4 degrees F hr sq ft/Btu per inch at 75 degrees F, minimum, when tested according to ASTM C518.
 - 3. Manufacturers:
 - a. ROCKWOOL (ROXUL, Inc); CAVITYROCK: www.rockwool.com/#sle.
 - b. ROCKWOOL (ROXUL, Inc); COMFORTBOARD 80: www.rockwool.com/#sle.

- c. Substitutions: See Section 01 6000 - Product Requirements.
- 4. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**

2.3 BATT INSULATION MATERIALS

- A. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
- B. **Sustainable Design Requirements:**
 - 1. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Provide Material Ingredient Report.**

2.4 ACCESSORIES

- A. Insulation Fasteners: Appropriate for purpose intended and approved by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards horizontally on foundation perimeter.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate at following frequency:
 - 1. Six (6) per insulation board.
- B. Install boards to fit snugly between wall ties.
- C. Install boards horizontally on walls.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- C. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
 - 2. Notify in ABAA writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.6 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.
- B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2 RELATED REQUIREMENTS

- A. Section 01 9119 - Building Envelope Commissioning: Supplemental installation requirements for weather barriers pertaining to objectives and criteria of the building enclosure system.

1.3 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.4 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.
- B. ABAA - Air Barrier Association of America.
- C. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- D. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
- E. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- H. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2018.
- I. ASTM E1354 - Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter; 2017.

- J. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- K. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.
- L. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.

1.5 SUBMITTALS

- A. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- B. Product Data: Provide data on material characteristics and performance criteria. Include confirmation that product(s) are compatible with adjacent materials for proposed use.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For air/vapor barriers: Material Ingredient Report.**
- D. Shop Drawings: Provide drawings of special joint conditions. Include specific details at interfaces with other materials that form part of the weather resistant barrier and a letter from the product manufacturer indicating that the project-specific details have been reviewed and approved for use.
- E. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP. Include evidence of current accreditation and certification under the ABAA QAP.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
 - 1. Provide documentation that describes quality assurance/quality control program and procedures.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.
 - 1. Provide a list of ABAA-certified installers and supervisors employed to work on the project.
 - 2. Provide documentation that describes quality assurance/quality control program and procedures.
- H. Construction Checklists: Provide documentation included with Section 01 9119 - Building Envelope Commissioning to verify visual inspection of substrates prior to application, manufacturer's wet film thickness of installed work, adhesion test as field quality control, and visual inspection of the completed system with any corrected deficiencies.

1.6 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

- 2. **Manufacturer Qualification:** Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.
 - B. **Preinstallation Meeting:** Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.
 - C. **Sole source,** to the greatest extent possible, air barrier materials and accessories. If sole sourcing cannot be attained, ensure compatibility among materials by differing manufacturers.
- 1.7 **MOCK-UP**
- A. Install air barrier and water-resistive barrier materials in mock-up where directed.
- 1.8 **FIELD CONDITIONS**
- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

- A. **Water-Resistive Barrier:** Provide on exterior walls under cladding where indicated on the drawings.
 - 1. Use building paper unless otherwise indicated.
- B. **Air Barrier:**
 - 1. On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
 - 2. On outside surface of sheathing of exterior stud cavity walls use air barrier sheet, self-adhesive type.
- C. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**

2.2 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

- A. **Building Paper:** Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC308 Grade D.
 - 1. **Water Penetration Resistance:** Withstand a water head of 21 inches, minimum, for minimum of five hours, when tested in accordance with AATCC Test Method 127.

2.3 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. **Air Barrier Sheet, Self-Adhered:**
 - 1. **Air Permeance:** 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 2. **Water Vapor Permeance:** 10 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
 - 3. **Ultraviolet (UV) and Weathering Resistance:** Approved in writing by manufacturer for up to 90 days of weather exposure.
 - 4. **Surface Burning Characteristics:** Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.

5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 6. Manufacturers:
 - a. Carlisle Coatings and Waterproofing, Inc: www.carlisleccw.com/#sle.
 - b. Henry Company: www.henry.com/#sle.
 - c. W.R. Meadows, Inc.: [www.wrmeadows.com/.](http://www.wrmeadows.com/)
- B. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
- C. Air Barrier Coating:
1. Air Permeance: 0.04 cubic feet per minute per square foot at 75 Pa, maximum, when tested in accordance with ASTM E2357.
 2. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 3. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Performance: Conform with ASTM E1354.
 5. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 6. Manufacturers:
 - a. Dow Chemical Company; Defend Air 200: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Momentive Performance Materials, Inc/GE Construction Sealants; SilShield 2600: www.siliconeforbuilding.com/#sle.
 - c. PROSOCO, Inc; R-GUARD Cat 5: www.prosoco.com/r-guard/#sle.

2.4 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.
- C. Pre-formed Transition Membrane: Semi-rigid silicone or polyester composition, tapered edges, tear resistant.
1. Manufacturers:
 - a. Dow Chemical Company; Silicone Transition Strip: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Momentive Performance Materials, Inc/GE Construction Sealants; RF100 Reinforcing Fabric: www.siliconeforbuilding.com/#sle.
 - c. PROSOCO; SureSpan EX: <https://prosoco.com/product/surespan-ex/>.
- D. Liquid Flashing: One part, fast curing, non-sag, gun grade, trowelable liquid flashing.
1. Manufacturers:
 - a. Dow Chemical Company; 778 Silicone Liquid Flashing: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Momentive Performance Materials, Inc/GE Construction Sealants; Elemex 5000 Liquid-Applied Flashing: www.siliconeforbuilding.com/#sle.
 - c. PROSOCO; FastFlash: <https://prosoco.com/product/r-guard-fastflash/>.
- E. Thinners and Cleaners: As recommended by material manufacturer.
- F. Cant Strips: Wood, pressure preservative treated; as specified in Section 06 1000.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive weather barriers in accordance with manufacturer's instructions. Installation of product indicates acceptance of substrate conditions.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 - 4. Install water-resistive barrier over jamb flashings.
 - 5. Install air barrier and vapor retarder UNDER jamb flashings.
 - 6. Install head flashings under weather barrier.
 - 7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- E. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
 - 3. Use flashing to seal to adjacent construction and to bridge joints.
- F. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.

5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- C. Coordination of ABAA Tests and Inspections:
 1. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection. ABAA inspector is to be on-site once every 14 days, minimum, during installation.
 2. Cooperate with ABAA testing agency.
 3. Allow access to air barrier work areas and staging.
 4. Do not cover air barrier work until tested, inspected, and accepted.
- D. Do not cover installed weather barriers until required inspections have been completed.
- E. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- F. Take digital photographs of each portion of the installation prior to covering up.
- G. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- H. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air-barrier system has been provided.
 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 4. Site conditions for application temperature and dryness of substrates have been maintained.
 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 6. Surfaces have been primed.
 7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
 8. Termination mastic has been applied on cut edges.
 9. Air barrier has been firmly adhered to substrate.
 10. Compatible materials have been used.
 11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 13. All penetrations have been sealed.
- I. Tests: As determined by Owner's testing agency from among the following tests:
 1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.

2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E783.
 3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. (110 kPa) according to ASTM D4541 for each 600 sq.ft. (56 sq. m) of installed air barrier or part thereof.
- J. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components, at contractor's expense, for retesting as specified above.
- K. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 4210 - COMPOSITE FRAMING SUPPORT (CFS) CLIP SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Composite framing support (CFS) system integrated with metal wall panels exterior wall cladding.
 - 1. Substrate: Exterior sheathing over metal stud framing or Concrete masonry units (CMU).

1.2 REFERENCE STANDARDS

- A. ASCE American Society of Civil Engineers (www.asce.org)
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010 with Supplements and Errata
 - 2. ASCE - Structural Plastics Design Manual
- B. ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers (www.ashrae.org)
 - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013
 - 2. ASHRAE 189.1 - Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings; 2014
- C. ASTM International (American Society for Testing and Materials; www.astm.org)
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015
 - 2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2015
 - 3. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013
 - 4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014
 - 5. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw- <http://www.astm.org/Standards/C754.htm> Attached Gypsum Panel Products; <http://www.astm.org/Standards/C754.htm> 2015
 - 6. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013
 - 7. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2011
 - 8. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014a
 - 9. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010e1
 - 10. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2010e1
 - 11. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014
 - 12. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014
 - 13. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer; 2008e1
 - 14. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2015
 - 15. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2010

16. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2013
 17. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2013a
 18. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012
 19. ASTM D4385 - Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products; 2013
 20. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a
 21. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2015
 22. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 04(2012)
 23. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013
- D. IBC - International Building Code (International Code Council); 2012
- E. IECC - International Energy Conservation Code; 2015
- F. IgCC - International Green Construction Code; 2012
- G. NFPA - National Fire Protection Association (www.nfpa.org)
1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012
- H. Voluntary Product Standard; National Institute of Standards and Technology (NIST)
1. PS 1 - Structural Plywood; 2009

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate construction of wall cladding support system over substrate indicated for proper drainage, flashing, trim, back-up support, soffits, and other related Work.
1. Review and finalize construction schedule.
 2. Verify availability of materials, installer's personnel, equipment, and facilities needed to maintain schedule.
 3. Review means and methods related to installation, including manufacturer's written instructions.
 4. Examine support conditions for compliance with requirements, including alignment and attachment to structural support system.
 5. Review flashings, wall cladding details, wall penetrations, openings, and condition of other construction that affects this Work.
 6. Review temporary protection requirements for during and after installation of this Work.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- C. Product Data: Submit for each type of product indicated; include construction details, material descriptions, dimensions of individual components and profiles, and accessories as necessary for complete fully functioning and assembled system.

- D. Test and Inspection Reports: Submit test and inspection reports on each type of wall cladding/veneer system based on evaluation of comprehensive tests performed by nationally recognized testing agency.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.
- B. Installer: Company specializing in performing work of this section and the following:
 - 1. Install system in strict compliance with manufacturer's installation instructions.
 - 2. Have not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original unopened containers and packaging with labels clearly identifying product name and manufacturer.
- B. Deliver components and other manufactured items or accessories without damage or deformation.
- C. Storage: Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with manufacturer's written instructions.
- D. Protect components and auxiliary accessories during transportation, handling, and installation from moisture, excessive temperatures and other construction operations in accordance with manufacturer's written instructions.
- E. Handle components in strict compliance with manufacturer's written instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface, edge or corner damage.

1.7 SITE CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work in accordance with manufacturer's written installation instructions and warranty requirements.

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. CFS System Warranty: Provide written warranty by manufacturer agreeing to correct defects in manufacturing within five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Advanced Architectural Products; SMARTci GreenGirt Clips Composite Framing Support (CFS) System: www.smartcisystems.com/.
 - 1. Other products shall be pre-submitted and approved products that meet materials and performance requirements with specified and validated third party testing.

2.2 DESCRIPTION

- A. Attach CFS clip system components through exterior sheathing into metal stud framing.
 - 1. Refer to Section 05 4000 for metal stud framing.
 - 2. Refer to Section 06 1000 for exterior sheathing.
 - 3. Refer to Section 04 2000 for CMU substrate.
- B. Install CFS clip system components vertically through exterior sheathing into stud support system as indicated on drawings in compliance with specified requirements.
- C. Install CFS clip system components vertically onto masonry substrate system with shims as indicated on drawings in compliance with specified requirements.

2.3 PERFORMANCE REQUIREMENTS

- A. System Thermal Design: Ensure installed insulation and CFS clip system, sub-framing, clips and cladding attachment does not have thermal bridging of fasteners or framing that creates a continuous metal path from exterior surface of insulation to interior face of insulation.
 - 1. System thermal design shall meet or exceed thermal design requirements in compliance with ASHRAE 90.1 energy code.
 - 2. Thermal Performance Test: Provide thermal resistance (R-value) indicated, in compliance with ASTM C1363, corrected to 15 mph outside and still air inside, with installed condition including fastening and joints.
 - a. Provide efficiency of no less than 97 to 99 percent, with a maximum temperature differential of 18 degrees F from interior wall surface to interior wall cavity and node locations with a 70 degrees F exterior to interior wall temperature delta.
 - b. Provide test unit with at least one insulation panel horizontal and vertical joint length and height of test chamber area.
 - c. Provide finite element analysis of three dimensional simulation of described wall assembly sealed by professional engineer in compliance with performance requirements and exceeding it by at least 3 percent.
- B. Temperature: Comply with structural loading requirements within temperature range of minus 55 degrees F to 180 degrees F.
- C. Fire-Test-Response Characteristics: Provide composite framing support system with fire-test results indicated as determined by test standard indicated and applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: In compliance with ASTM E84, for foam insulation, fiber reinforced polymer (FRP) and interior surfaces as follows:
 - a. Flame Spread Index (FSI): 25 or less.
 - b. Smoke Developed Index (SDI): 450 or less.

2. Intermediate Scale Multistory Fire Test: Comply with NFPA 285 and/or IBC acceptance criteria for wall height above grade and fire separation distances, when wall type and other noted conditions require such testing or compliance with requirements as indicated.

2.4 COMPOSITE FRAMING SUPPORT (CFS) CLIP

- A. CFS Clip: Provide CFS Clip consisting of polyester and vinyl ester bioresin matrix (FRP) with recycled materials, fire retardant additives and integral continuous metal inserts the length of clip profile. Reinforce CFS clip with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
 1. Length of Clip; GreenGirt: 6 inch long.
 2. Depth of Clip; GreenGirt: as shown on the drawings.
 3. Grid Spacing of CFS Clips; Horizontally & Vertically: 16 by 32 inches, with maximum area of 4 sq. ft. (576 sq. inches.)
 4. Provide continuous non-corrosive steel insert for engagement of fasteners, at least 16 gage, 0.0598 inch (1.52 mm) thick with G90 galvanized coating designation in compliance with ASTM A653/A653M.
 - a. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of CFS.
 5. Provide integral compression seal in CFS sections to ensure insulation will not dislodge.
 6. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
 7. Provide force distribution zones integrally designed into profile of CFS.
 8. Flammability: Comply with ASTM E84.
 9. Self-Extinguishing: Comply with ASTM D635.
 10. Profile Visual Requirements: Comply with ASTM D4385.
 11. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D638.
 12. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D695.
 13. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D790.
 14. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety factors.
 15. Barcol Hardness: 45, in accordance with ASTM D2583.
 16. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with ASTM D570.
 17. Density: Within range of 0.062 to 0.070 lbs/cubic inch, in accordance with ASTM D792.
 18. Lengthwise Coefficient of Thermal Expansion: 7.0×10^{-6} inch/inch/degrees F, in accordance with ASTM D696.
 19. Notched Izod Impact, Lengthwise: 24 ft lbs/inch, in accordance with ASTM D256 within temperature range indicated.
 20. Notched Izod Impact, Crosswise: 4 ft lbs/inch, in accordance with ASTM D256 within temperature range indicated.

2.5 INSULATION

- A. See Section 07 2100 - Thermal Insulation, for continuous insulation requirements.

2.6 ASSEMBLY

- A. Assemble CFS clip system using manufacturer's standard procedures and processes identical to tested units and as necessary to comply with performance requirements indicated.
 - 1. Comply with CFS clip system and dimensional and structural requirements as indicated on drawings.
 - 2. Erect CFS clip system in established sequence in accordance with manufacturer's standard installation procedures.
 - 3. Provide spray foam sealant on backside of cantilevered fasteners that completely puncture insulation layer.

2.7 ACCESSORIES

- A. Provide accessories necessary for complete CFS clip system including metal closure trim and similar items.
- B. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as recommended by CFS clip system manufacturer for project application.
 - 1. Cladding subframing to CFS Clip System: Use standard self-tapping metal screws.
 - 2. CFS System to Metal Stud Wall Framing: Use standard self-tapping metal screws.
 - 3. CFS System to Concrete/CMU: Use standard masonry or concrete screw anchors in predrilled hole.
 - 4. DO NOT USE power, air, or gas actuated fasteners or actuated fastener tools. DO NOT USE impact wrenches when fastening to or from the CFS.
- C. Wall Sheathing: Refer to Section 06 1000 for requirements.
- D. Weather Resistant Barrier (WRB): Refer to Section 07 2500 for requirements.
- E. Sealants: Refer to Section 07 9200 for sealant information.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas of this work, and project conditions with installer present for compliance with requirements for installation tolerances, substrates, CFS system conditions, and other conditions affecting performance of this Work.
- B. Examine structural wall framing to ensure that angles, channels, studs, and other structural support members have been installed within alignment tolerances required by CFS system manufacturer.
- C. Examine rough-in for components and systems penetrating CFS system to coordinate actual locations of penetrations relative to CFS systems joint locations prior to installation.
- D. Verify that mechanical and electrical services for exterior walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.
- E. Proceed with installation only after wall substrate surfaces have been properly prepared and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by CFS manufacturer for achieving best result for substrate under project conditions.
- C. Prepare sub-framing, base angles, sills, furring, and other CFS system members and provide anchorage in accordance with ASTM C754 for substrate type and wall cladding type in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

- A. Install CFS clip system in accordance with manufacturer's installation instructions.
- B. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.
- C. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of insulation.
- E. Exterior wall insulation is not intended to be left exposed for extended periods of time without adequate protection.
- F. Install CFS clip system in compliance with system orientation, sizes, and locations as indicated on drawings.

3.4 TOLERANCES

- A. Shim and align CFS system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb, and on location lines as indicated.

3.5 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Ensure that insulation panels are not exposed to moisture.
 - 1. Remove wet insulation panels or allow them to completely dry prior to installation of CFS system.
- C. Replace damaged insulation prior to Date of Substantial Completion.

END OF SECTION

SECTION 07 4213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior curtain wall system consisting of formed metal composite material (MCM) sheet, framing, secondary supports, and anchors to structure.
- B. Matching flashing and trim.

1.2 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- I. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- J. ASTM D523 - Standard Test Method for Specular Gloss.
- K. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.
- L. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
- M. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- P. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

- Q. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- R. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
 - 3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 4. Review procedures for protection of work and other construction.

1.4 SUBMITTALS

- A. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 - 2. Storage and handling requirements and recommendations.
 - 3. Fabrication instructions and recommendations.
 - 4. Specimen warranty for finish, as specified herein.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
 - 4. Specimen warranty for wall system, as specified herein.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For panels: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For panels with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For panels: Material Ingredient Report.**
- D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
 - 1. Indicate panel numbering system.
 - 2. Differentiate between shop and field fabrication.
 - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
 - 4. Include large-scale details of anchorages and connecting elements.

5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- E. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.
- F. Certificate: Certify that the work results of this section meet or exceed specified requirements.
- G. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
- H. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
- I. Test Report: Submit report of full-size mock-up test for NFPA 285 fire performance.
- J. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
- K. Installer's Qualification Statement.
- L. Testing Agency's Qualification Statement.
- M. Maintenance Data: Care of finishes and warranty requirements.
- N. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
- B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section.
1. With minimum three years of documented experience.
 2. Approved by wall panel system manufacturer.
- D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.
- E. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
1. Locate where directed.
 2. Provide panels finished as specified.
 3. Mock-up may not remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect finishes by applying heavy duty removable plastic film during production.
 - 2. Package for protection against transportation damage.
 - 3. Provide markings to identify components consistently with drawings.
 - 4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in well ventilated space out of direct sunlight.
 - 2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
 - 3. Store at a slope to ensure positive drainage of any accumulated water.
 - 4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
 - 5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

- A. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a five year period after Date of Substantial Completion.
- B. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
 - 1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
 - 2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
 - 3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Composite Material (MCM) Sheet Manufacturers:
 - 1. 3A Composites USA; Alucobond: www.alucobondusa.com/#sle.
 - 2. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): www.alpolic-americas.com/#sle.
 - 3. ATAS International, Inc; SterraCore: www.atas.com/#sle.

2.2 WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
 - 1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
 - 2. Provide panel jointing and weatherseal using reveal joints and gaskets but no sealant.

3. Anchor panels to supporting framing without exposed fasteners.
- B. Performance Requirements:
1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
 2. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
 - a. Inward and Outward Design Wind Pressures as indicated on the drawings.
 - b. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
 - c. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
 3. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
 - a. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
 - b. Design to drain leakage and condensation to the exterior face of the wall.
 4. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing must be performed specifically for this project.
 5. Building Envelope Performance: Complies with ASHRAE Std 90.1 I-P when tested as part of a building envelope assembly.
- C. Panels: One inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
 2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
 3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
 4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
 5. Fabricate panels under controlled shop conditions.
 6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
 7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
 - a. Make panel lines, breaks, curves and angles sharp and true.
 - b. Keep plane surfaces free from warp or buckle.
 - c. Keep panel surfaces free of scratches or marks caused during fabrication.
 8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.
 9. For "dry" jointing, secure extrusions to returned pan edges with stainless steel rivets; provide means of concealed drainage with baffles and weeps for water that might accumulate in members of system.

2.3 MATERIALS

A. Sustainable Design Requirements:

1. **For panels: Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 2. **For panels having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 3. **For panels: Material Ingredient Report.**
- B. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
1. Overall Sheet Thickness: 0.157 inch, minimum.
 2. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
 3. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 4. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
 5. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss to match sample.
 - a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Valspar; Fluoropon: www.valsparcoilextrusion.com/#sle.
 6. Color/Texture: Custom color to match Architect's sample; manufacturer's standard texture.
- C. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
 2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
 3. Stainless Steel Sheet Components: ASTM A480/A480M.
 4. Refer to Section 07 4210 for additional requirements on panel support framing.
- D. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; refer to Section 07 6200 for additional requirements. Use heavy-gauge aluminum where indicated.
- E. Anchors, Clips and Accessories: Use one of the following:
1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
 2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
 3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 10.
- F. Fasteners:
1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
 2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.

- 3. Bolts: Stainless steel.
- 4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.
- G. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine dimensions, tolerances, and interfaces with other work.
 - 1. Verify that weather barrier system is properly installed, refer to Section 07 2500 for requirements.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during installation.

3.3 INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

- H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
 - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
- I. Replace damaged products.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
- C. Site Visits: Schedule two site visits during execution of installation.

3.5 CLEANING

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

3.6 PROTECTION

- A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 5400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Flashings.
- F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 RELATED REQUIREMENTS

- A. Section 01 9119 - Building Envelope Commissioning: Supplemental installation requirements for weather barriers pertaining to objectives and criteria of the building enclosure system.
- B. Section 05 3100 - Steel Decking: Product requirements for acoustical insulation for deck flutes, for placement by this section.
- C. Section 06 1000 - Rough Carpentry: Wood cant strips and vertical cover board.

1.3 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- B. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- D. FM (AG) - FM Approval Guide.
- E. FM DS 1-28 - Wind Design.
- F. NRCA (RM) - The NRCA Roofing Manual.
- G. NRCA (WM) - The NRCA Waterproofing Manual.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- C. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners. Include confirmation that product(s) are compatible with adjacent materials for proposed use.
- D. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For roofing membrane and insulation: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For membrane with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For roofing membrane, insulation and vapor retarder: Material Ingredient Report.**
- E. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- H. Manufacturer's Qualification Statement. Provide documentation that describes quality assurance/quality control program and procedures.
- I. Installer's Qualification Statement.
 - 1. Provide documentation from manufacturer stating installer is approved and capable of installing roofing membrane and related systems.
 - 2. Provide documentation that describes quality assurance/quality control program and procedures.
- J. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.
- K. Construction Checklists: Provide documentation included with Section 01 9119 - Building Envelope Commissioning to verify visual inspection of substrates prior to application, proper hot-air welds, and visual inspection of the completed system with any corrected deficiencies.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.
- B. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.9 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 30 years, no dollar limit.
 - 2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Weld TPO 80 mil: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC; UltraPly TPO XR 80 mil: www.firestonebpc.com/#sle.

3. GAF; EverGuard TPO 80 mil: www.gaf.com/#sle.
4. Tremco; TremPly TPO 80 mil: www.tremcoroofing.com/.

2.2 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over vapor retarder and insulation.
- B. Acceptable Insulation Types - Constant Thickness Application:
 1. Minimum 2 layers of polyisocyanurate board.
- C. Acceptable Insulation Types - Tapered Application:
 1. Tapered polyisocyanurate board.

2.3 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. **Sustainable Design Requirements**
 1. **For roofing membrane and insulation: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 2. **For membrane with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 3. **For roofing membrane, insulation and vapor retarder: Material Ingredient Report.**
- B. Membrane Roofing Materials:
 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
 - a. Thickness: 80 mil, 0.080 inch, minimum.
 2. Sheet Width: Factory fabricated into largest sheets possible.
 3. Color: White.
- C. Seaming Materials: As recommended by membrane manufacturer.
- D. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
 1. Fire-retardant adhesive.
- E. Flexible Flashing Material: Same material as membrane.
 1. Provide high temperature membrane at metal coping cap conditions.

2.4 DECK SHEATHING AND COVER BOARDS

- A. Deck Sheathing: Gypsum sheathing, ASTM C1396/C1396M, Type X, special fire resistant type, 5/8 inch thick.
- B. Cover Board for horizontal surfaces: Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 1/2 inch thick, factory primed.
- C. Cover Board for vertical surfaces: Plywood, PS 1, Grade C-C, Exterior Exposure, 1/2 inch thick.

2.5 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 1. Classifications:

- a. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
- 2. Board Size: 48 by 96 inch.
- 3. Board Thickness: 1.5 inch.
- 4. Tapered Board: Slope as indicated; minimum thickness 1 inch; fabricate of fewest layers possible.

2.6 ACCESSORIES

- A. Prefabricated Roofing Expansion Joints: As specified in Section 07 9513.
- B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- C. Cant Strips: Wood, pressure preservative treated; as specified in Section 06 1000.
- D. Sheathing Joint Tape: Paper type, 6 inch wide, self adhering.
- E. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.
- F. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- G. Membrane Adhesive: As recommended by membrane manufacturer.
- H. Insulation Adhesive: As recommended by insulation manufacturer.
- I. Sealants: As recommended by membrane manufacturer.
- J. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Roofing membrane manufacturer's standard.
 - 2. Surface Color: White.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 METAL DECK PREPARATION

- A. Install preformed sound absorbing glass fiber insulation strips supplied by Section 05 3100 in acoustic deck flutes. Install in accordance with manufacturer's instructions.
- B. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
 - 4. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.
 - a. Over entire roof area, fasten sheathing using 6 fasteners with washers per sheathing board.

3.3 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.4 VAPOR RETARDER AND INSULATION - UNDER MEMBRANE

- A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
- B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- C. Attachment of Insulation:
 - 1. Embed first layer of insulation in full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
 - 2. Mechanically fasten subsequent layer of insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- D. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

- E. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- F. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- G. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- H. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- I. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- J. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- K. Do not apply more insulation than can be covered with membrane in same day.

3.5 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate recommended by manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up the full height of vertical surfaces.
 - 2. Fully adhere and lap flexible flashing over membrane and up to nailing strips.
- F. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.
- G. Around roof penetrations, seal flanges and flashings with flexible flashing.
- H. Install roofing expansion joints where indicated. Make joints watertight.
- I. Coordinate installation of roof drains and sumps and related flashings.

3.6 FINISHING UNBALLASTED SURFACES

- A. Install walkway pads. Space pad joints to permit drainage.

3.7 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.
- B. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.

- C. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.8 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.
- B. Precast concrete splash pads.

1.2 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- G. CDA A4050 - Copper in Architecture - Handbook.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

- A. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 4 x 4 inch in size illustrating metal finish color.

1.4 QUALITY ASSURANCE

- A. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.
- B. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five (5) years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's custom colors.
- B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with fluoropolymer coating.
 - 1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's custom colors.

2.2 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

2.3 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: SMACNA (ASMM), Rectangular profile.
- B. Downspouts: Rectangular profile.
- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
- D. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.

- E. Splash Pads: Precast concrete type, of size and profiles required; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
 - 1. Provide at downspout locations terminating at horizontal roofing.

F. Downspout Boots: Cast iron.

G. Seal metal joints.

2.4 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Secure gutters and downspouts in place with concealed fasteners.
- F. Connect downspouts to downspout boots, and grout connection watertight.
- G. Set splash pads under downspouts.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.

- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- C. ITS (DIR) - Directory of Listed Products.
- D. FM 4991 - Approval Standard for Firestop Contractors.
- E. FM (AG) - FM Approval Guide.
- F. SCAQMD 1168 - Adhesive and Sealant Applications.
- G. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- H. UL (FRD) - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For firestopping materials: Product-specific declaration, industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For firestopping materials: Material Ingredient Report.**
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Installer Qualification: Submit qualification statements for installing mechanics.

1.4 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Approved by Factory Mutual Research Corporation under FM 4991
 - 2. Verification of minimum three years documented experience installing work of this type.
 - 3. Licensed by local authorities having jurisdiction (AHJ).

1.5 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
 - 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
- B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.
- C. If accepted, mock-up will represent minimum standard for the Work.
- D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.6 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
 - 2. Hilti, Inc: www.us.hilti.com/#sle.
 - 3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.2 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. **Sustainable Design Requirements**
 - 1. **Provide product-specific declaration, industry-wide EPD or product-specific EPD.**
 - 2. **Provide Material Ingredient Report.**

- C. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

2.4 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.4 FIELD QUALITY CONTROL

- A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.5 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. Owner-provided field quality control.

1.2 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- C. ASTM C834 - Standard Specification for Latex Sealants.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- I. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- J. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- K. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- L. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- M. SCAQMD 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

- A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 4. Substrates the product should not be used on.
 5. Substrates for which use of primer is required.
 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, VOC content, and recommended tools.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
1. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For sealants: Material Ingredient Report.**
 2. **EQ Credit 2: Low-Emitting Materials**
 - a. **For wet-applied sealants and sealant primers within the building envelope: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.**
- D. Color Cards for Preliminary Selection: Where sealant color is not specified, submit manufacturer's color cards showing full range of colors available for selection. Architect may select up to three colors for final selection at each condition.
- E. Field Samples for Verification: Provide a maximum of three color samples for each condition requiring color selection (up to 6 locations selected by Architect), including custom colors, installed in-situ, 12 inches in length, to be reviewed by Architect for final color selection.
- F. Preconstruction Laboratory Test Reports: Submit with Product Data.
- G. Joint Sealant Schedule: Include the following information:
1. Joint sealant substrate application, joint location, and designation.
 2. Joint sealant manufacturer and product name.
 3. Joint sealant primer and backer.
 4. Joint sealant color.
 5. Any special conditions.
- H. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- I. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Preconstruction Laboratory Testing:
1. Adhesion Testing: In accordance with ASTM C794.

2. Compatibility Testing: In accordance with ASTM C1087.
 3. Stain Testing: In accordance with ASTM C1248; required only for porous substrates.
 4. Provide data showing previous testing on each combination of sealant, substrate, backing and accessories used on this Project, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
 - a. If a substrate used on the Project has not been tested within the last 24 months, arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories. Allow sufficient time for testing to avoid delaying the work, and deliver sufficient samples to manufacturer for testing. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- E. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.
- F. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
 2. Destructive field adhesion testing of sealant joints, except interior sealant joints.
 - a. For each different sealant and substrate combination, allow for one test every 1000 linear feet (305 meters).
 - b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
 3. Field Quality Control Log Form: Show same data fields as on Joint Sealant Schedule, adding date of installation of field sample to be tested and date of test, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- G. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
 2. Have a copy of the test method document available during tests.
 3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
 4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inch long.
 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.

3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

I. See Section 01 9119 - Building Envelope Commissioning, for additional requirements.

1.5 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
 1. Provide 20-year warranty for silicones; minimum 10-year warranty for urethanes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 2. Pecora Corporation: www.pecora.com.
 3. Sherwin-Williams Company: www.sherwin-williams.com.
 4. Sika Corporation: www.usa-sika.com.
 5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 2. Pecora Corporation: www.pecora.com.
 3. Sika Corporation: www.usa-sika.com.
 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.

- 1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
- 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
- c. Other joints indicated below.
3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 2. Control and Expansion Joints in Concrete Paving: Self-leveling or Nonsag polyurethane "traffic-grade" sealant.
 3. Concealed, non-dynamic "bedding" joints, such as door thresholds: Butyl rubber, non-curing
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 2. Floor Joints in Wet Areas: Nonsag or Self-leveling polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
 3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; .
 4. In Sound-Rated Assemblies: Acrylic emulsion latex or water-based elastomeric sealant.
 5. Narrow Control Joints in Interior Exposed Concrete Slabs: Self-leveling epoxy sealant.
 6. Tile control and expansion joints in Wet Areas: Mildew-resistant silicone sealant
- D. Interior Wet Areas include: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.3 JOINT SEALANTS - GENERAL

- A. **Sustainable Design Requirements:**
 1. **Provide Material Ingredient Report.**
 2. **Provide documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.**

2.4 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Non-Staining To Porous Materials: Non-staining to porous materials when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

4. Custom Color: To be selected by Architect from manufacturer's full custom range.
 5. Cure Type: Single-component, neutral moisture curing.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Custom Color: To be selected by Architect.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Custom Color: To be selected by Architect from manufacturer's full custom range.
- D. Nonsag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's full range.
- F. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.5 SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Single or multicomponent, 100 percent solids by weight.
 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 3. Custom Color: To be selected by Architect .
 4. Joint Width, Minimum: 1/8 inch.

2.6 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 - 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
 - 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 - 3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.

- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- C. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 07 9513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Expansion joint cover assemblies for floor, wall, ceiling, and roof surfaces.

1.2 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

1.3 SUBMITTALS

- A. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content metal: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. Interior Floor Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; D-Series, No-Bump: www.archart.com/.
 - b. Balco; HDNB: www.balcousa.com/.
 - c. MM Systems; LASB-NB: www.mmsystemscorp.com/
- B. Interior Wall-to-Wall Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; C-Series: www.archart.com/.
 - b. Balco; 75FWG/75FWPE: www.balcousa.com/
 - c. MM Systems; FSW/FSWL: www.mmsystemscorp.com/.

- C. Interior Wall-to-Floor Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; L-Series, Corner Low: www.archart.com/.
 - b. Balco; HDNBL: www.balcousa.com/.
 - c. MM Systems; LASBE-NB: www.mmsystemscorp.com/.
- D. Interior Wall-to-Ceiling Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; C-Series, Corner: www.archart.com/.
 - b. Balco; 75FCACE: www.balcousa.com/.
 - c. MM Systems; FSWL: www.mmsystemscorp.com/.
- E. Exterior Wall-to-Wall Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; L-Series, Corner Low: www.archart.com/.
 - b. Balco; CMX/CMXL with BCSW: www.balcousa.com/.
 - c. MM Systems; WJL: www.mmsystemscorp.com/.
- F. Exterior Wall-to-Roof Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; L-Series, Corner Low: www.archart.com/.
 - b. Balco; LPRE: www.balcousa.com/.
 - c. MM Systems; WJL: www.mmsystemscorp.com/.
- G. Roof-to-Roof Joints Subject to Movement:
 - 1. Manufacturers:
 - a. Architectural Art Mfg.; L-Series, Flat: www.archart.com/.
 - b. Balco; LPR: www.balcousa.com/.
 - c. MM Systems; RXH: www.mmsystemscorp.com/.

2.2 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
 - 4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. **Sustainable Design Requirements:**
 - 1. **Provide documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- C. Floor Joint Covers: Coordinate with indicated floor coverings.
- D. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
 - 1. Exposed Finish Outdoors: Painted; color to be selected by Architect from manufacturer's custom range.
 - 2. Exposed Finish at Floors: Mill finish or natural anodized.
- B. Resilient Seals:
 - 1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
 - 2. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
 - 3. For Vehicular Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
 - 4. Color: Gray.
- C. Anchors and Fasteners: As recommended by cover manufacturer.
- D. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.
- E. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.3 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.
- B. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Thermally insulated hollow metal doors with frames.
- D. Sound-rated hollow metal doors and frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.2 ABBREVIATIONS AND ACRONYMS

- A. ANSI - American National Standards Institute.
- B. HMMA - Hollow Metal Manufacturers Association.
- C. NAAMM - National Association of Architectural Metal Manufacturers.
- D. NFPA - National Fire Protection Association.
- E. SDI - Steel Door Institute.
- F. UL - Underwriters Laboratories.

1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- J. ASTM E413 - Classification for Rating Sound Insulation.
- K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- U. UL (DIR) - Online Certifications Directory.
- V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- W. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, fire-resistance ratings, and finishes.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For steel doors: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For steel or aluminum with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Schedule: Provide a schedule of hollow metal work, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- E. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.2 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush, smooth faces. Refer to Door Schedule for additional information.
 - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
 - 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
- D. **Sustainable Design Requirements:**
1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 2. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

2.3 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thermal Resistance: R-Value of 4.75.
 4. Air Leakage: 0.30 cfm/sq ft, maximum, when tested in accordance with AAMA/WDMA/CSA101/I.S.2/A440 and uniform static air pressure difference of 6.24 psf.
 5. Door Thickness: 1-3/4 inch, nominal.
 6. Top Closures: Flush with top of faces and edges.
 7. Weatherstripping: Refer to Section 08 7100.
 8. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inch, nominal.
 4. Door Face Sheets: Flush, smooth faces.
 5. Door Finish: Factory primed and field finished.
- C. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

- a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Fire Rating: As indicated on drawings, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
 4. Provide units listed and labeled by UL (DIR).
 - a. Attach fire rating label to each fire rated unit.
 5. Smoke and Draft Control Doors: Doors withing the "SP" Smoke Partition line indicated on the CS Drawings to be same construction as fire-rated doors. Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - b. Gasketing: Coordinate with door hardware schedule. Provide additional gasketing or edge sealing as necessary to achieve leakage limit.
 - c. Label: Include the "S" label on fire-rating label of door.
 6. Core Material: Mineral board.
 7. Door Thickness: 1-3/4 inch, nominal.
 8. Door Face Sheets: Flush, smooth faces..
 9. Door Finish: Factory primed and field finished.
- D. Sound-Rated Interior Doors: Provide fire-rated door construction as specified above and the following sound-rated requirements:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 35, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
 3. Door Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
 4. Door Thickness: As required to meet acoustic requirements indicated.
 5. Door Face Sheets: Flush, smooth finish.
 6. Door Finish: Factory finished.
 7. Sound Seals: Integral, in door and/or frame.
 8. Opening Force of Sound-Rated Doors, Non-Fire Rated: 5 lbs, maximum, in compliance with ADA Standards.

2.4 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 3. Frame Finish: Factory primed and field finished.

- 4. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 2. Frame Finish: Factory primed and field finished.
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
- E. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- G. Transom Bars: Fixed, of profile same as jamb and head.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- I. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- J. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

2.5 ACCESSORIES

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
 - 1. Style: Sightproof inverted V blade.
 - 2. Louver Free Area: 50 percent, minimum.
 - 3. Fasteners: Concealed fasteners.
- B. Glazing: As specified in Section 08 8000.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Astragals for Double Doors: Specified in Section 08 7100.
- E. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.6 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- F. Coordinate installation of hardware.
- G. Coordinate installation of glazing.
- H. Coordinate installation of electrical connections to electrical hardware items.
- I. Touch up damaged factory finishes.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.

- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.6 SCHEDULE - **SEE DRAWINGS**

END OF SECTION

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, and acoustical.

1.2 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- B. ASTM E413 - Classification for Rating Sound Insulation.
- C. AWI (QCP) - Quality Certification Program.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- G. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- H. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- I. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.3 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For wood doors: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For wood doors with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For certified wood doors: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For wood doors: Material Ingredient Report.**
 - 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For composite wood doors: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure**

(ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- D. Samples: Submit two samples of door veneer, 12 x 12 inch in size illustrating wood grain, stain color, and sheen.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- G. Manufacturer's Installation Instructions: Indicate special installation instructions.
- H. Specimen warranty.
- I. Warranty, executed in Owner's name.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.6 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Eggers Industries: www.eggersindustries.com/#sle.
 - 2. Graham Wood Doors: www.grahamdoors.com/#sle.
 - 3. Marshfield DoorSystems, Inc: www.marshfielddoors.com/#sle.

2.2 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Extra Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS) or WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A requirements for "S" label; no additional gasketing or edge sealing allowed.
 - 4. Sound-Rated Doors: Minimum STC of 30 (typical), 45 for Music Classrooms, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
- C. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Documentation indicating percentage of new wood, percentage of FSC wood, and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.**
 - 4. **Provide Material Ingredient Report.**
 - 5. **Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**

2.3 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Any option allowed by quality standard for grade.
 - 2. "Running Match" each pair of doors and doors in close proximity to each other.

2.5 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

2.6 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 1, Lacquer, Nitrocellulose.
 - b. Sheen: Flat.
- B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-2, Catalyzed Lacquer.
 - b. Sheen: Flat.
- C. Factory finish doors in accordance with approved sample.

- D. Seal door top edge with color sealer to match door facing.

2.7 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1113.
- B. Metal Louvers: As specified in Section 08 1113.
- C. Glazing: As specified in Section 08 8000.
- D. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.
- E. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
 - 2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

3.3 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.5 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling access door and frame units.

1.2 SUBMITTALS

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR 3: BPDO - Sourcing of Raw Materials**
 - a. **For steel with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Material: Steel.
 - 2. Size: 12 inch by 12 inch.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 2. Size: 12 inch by 12 inch.
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- C. Fire-Rated Wall-Mounted Units:
 - 1. Wall Fire-Rating: As indicated on drawings.
 - 2. Size: 12 inch by 12 inch.
 - 3. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

- D. Ceiling-Mounted Units:
 - 1. Material: Steel.
 - 2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 - 3. Size - Other Ceilings: 12 inch by 12 inch.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2 WALL AND CEILING MOUNTED UNITS

- A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Door Style: Single thickness with rolled or turned in edges.
 - 2. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - 3. Steel Finish: Primed.
 - 4. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
- B. **Sustainable Design Requirements:**
 - 1. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3323 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead coiling doors and shutters, operating hardware, non-fire-rated and exterior; manually or electrically operated.
- B. Wiring from electric circuit disconnect to operator to control station.

1.2 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ITS (DIR) - Directory of Listed Products.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- E. NEMA MG 1 - Motors and Generators.
- F. UL (DIR) - Online Certifications Directory.
- G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.3 SUBMITTALS

- A. Product Data: Provide general construction, electrical equipment, and component connections and details.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content steel or aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 2.5 x 12 inch in size illustrating shape, color and finish texture.
- E. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.4 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Exterior Overhead Coiling Doors:
 - 1. C.H.I. Overhead Doors; Model 6182: www.chiohd.com/#sle.
 - 2. Clopay Building Products; Model CERC10: www.clopaydoor.com/#sle.
 - 3. McKeon Door Company; ClimateGuard, IS3000 Series: www.mckeondoor.com/.
- B. Interior Overhead Coiling Counter Shutters:
 - 1. C.H.I. Overhead Doors; 6522: www.chiohd.com/#sle.
 - 2. Clopay Building Products; Model CESD20: www.clopaydoor.com/#sle.
 - 3. McKeon Door Company; CFS Series: www.mckeondoor.com/.

2.2 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
 - 1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
 - 2. Maximum allowable rate of air leakage is 1.00 cfm/sq ft when tested in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf..
 - 3. Finish: Galvanized.
 - 4. Finish: Factory painted, color as selected.
 - 5. Hood Enclosure: Manufacturer's standard; primed steel.
 - 6. Electric operation.
 - 7. Mounting: Within framed opening.
- B. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.
 - 1. Finish: Primed.
 - 2. Finish: Factory painted, color as selected.
 - 3. Hood Enclosure: Manufacturer's standard; primed steel.
 - 4. Manual hand chain lift operation.
 - 5. Mounting: Within framed opening.

2.3 MATERIALS AND COMPONENTS

- A. Curtain Construction: Interlocking slats.
 - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 - 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
 - 3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum thickness, 18 gage, 3/4 inch; ASTM A653/A653M galvanized steel sheet.
 - 1. Galvanizing: Minimum G90 coating.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.

- E. Lock Hardware:
 - 1. For motor operated units, additional lock or latching mechanisms are not required.
 - 2. Manual Chain Lift: Provide padlockable chain keeper on guide.
- F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.
- G. **Sustainable Design Requirements:**
 - 1. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

2.4 ELECTRIC OPERATION

- A. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Motor Enclosure:
 - a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
 - 3. Motor Rating: 1/3 hp; continuous duty.
 - 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 - 6. Controller Enclosure: NEMA 250, Type 1.
 - 7. Opening Speed: 12 inches per second.
 - 8. Brake: Adjustable friction clutch type, activated by motor controller.
 - 9. Manual override in case of power failure.
 - 10. Refer to Section 26 0583 for electrical connections.
- B. Control Station: Provide Best key-operated (Open-Close-Stop) continuous-constant control device for each operator conforming to UL 325.
 - 1. 24 volt circuit.
 - 2. Recess mounted, at interior door jamb.
 - 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms conforming to UL 325.
 - a. Secondary Device: Provide electric sensing edge with wireless edge kit or non-monitored safety edge as an option along with continuous-constant control device.
- C. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 26 0583.
- F. Complete wiring from disconnect to unit components.
- G. Complete wiring from fire alarm system.
- H. Install enclosure and perimeter trim.

3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.4 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3493 - AUTOMATIC OVERHEAD COILING FABRIC FIRE CURTAIN

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire alarm or smoke detector-activated, overhead coiling fabric fire curtain.
 - 2. Self-closing without auxiliary power.
- B. Related Requirements:
 - 1. Section 08 3100 - Access Doors and Panels.

1.2 REFERENCES

- A. NFPA Codes and Standards:
 - 1. 70 - National Electrical Code.
 - 2. 72 - National Fire Alarm Code-2007, 2010 and 2013.
 - 3. ASTM - E84 - Test Method for Surface Burning Characteristics of Building Materials
- B. UL Standards:
 - 1. 268 - Smoke detectors for fire protective signaling systems.
 - 2. 864 - Control units for fire protective signaling systems.
 - 3. 10B - Fire test for door assemblies.
 - 4. 10D - Fire test for fire resistant curtains.
 - 5. 1784 - Air leakage test

1.3 SUBMITTALS

- A. Comply with Section 01 3300, Submittal Procedures:
 - 1. Product data.
 - 2. Shop drawings:
 - a. Include opening dimensions.
 - b. Show and identify related work performed under other sections of the specifications.
 - c. Quality Assurance/Control Submittals:
 - 1) Certifications.
 - 2) Manufacturer's installation instructions and testing procedures.

1.4 CLOSEOUT SUBMITTALS

- A. Comply with Section 01 7700, Project Closeout:
 - 1. Operation and maintenance manual.
 - 2. Manufacturer's warranty.

1.5 QUALITY ASSURANCE

- A. Certifications:
 - 1. ETL Listing to UL standards:
 - a. 864 - Control units for fire protective signaling systems.
 - b. 268 - Smoke detectors for fire protective signaling systems.
 - c. 10D - Fire test for fire resistant curtains.
 - d. 1784 - Air leakage test

- B. Pre-Installation Meeting:
 - 1. Schedule and convene a pre-installation meeting prior to commencement of field operations with representatives of the following in attendance: Owner, Architect, General Contractor, fire curtain sub-contractor, and electrical sub-contractor.
 - 2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
 - 3. Document responsibilities of various parties and deviations from specifications and installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions.

1.7 WARRANTY

- A. Provide manufacturer's standard one year warranty.
- B. Maintenance and Testing:
 - 1. Perform minimum semi-annual maintenance and testing on each fire curtain as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
 - 2. Provide test documentation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Overhead Coiling Smoke Curtains
 - 1. Smoke Guard, Inc.; M2100: www.smokeguard.com/.
 - 2. McKeon Rolling Steel Door Co.; D200: www.mckeondoor.com/.
 - 3. U.S. Smoke and Fire; SD60: www.ussmokeandfirecurtain.com/.
- B. Label each fire curtain with following information:
 - 1. Manufacturer's name.
 - 2. Label of quality control agency.

2.2 PERFORMANCE / DESIGN CRITERIA

- A. Test normal and fire operation: Curtain to deploy on activation of building fire alarm system signal or test key switch. Curtain shall descend and rewind by motor drive.
 - 1. Raise curtain after test and after fire alarm is cleared. Reset curtain after test or operation of unit using key switch. No manual reset required. No service call needed. No replacement parts needed.
- B. Test to 6,000 cycles.

2.3 COMPONENTS

- A. Curtain Fabric: Glass fiber material coated on one side with a polyester polyurethane latex and steel wire reinforcement.
 - 1. Rating: 120 minutes.

- B. Side Guide Assembly:
- C. Housing/Bearing Type:
- D. Bottom Bar: Weighted for self-closing by gravity.
- E. Rewind Motor:
 - 1. Tubular motor with fail safe gravity deploy operation.
 - 2. 24 VDC.
- F. Control System:
 - 1. Comply with UL Standard 864.
 - 2. Battery backup supplied with the controls.
 - 3. 120 VAC
- G. Finishes:
 - 1. Manufacturer's standard galvanized finish.

2.4 FABRICATION

- A. Installation Configuration: Housing attached directly to substrate above opening or to wall.
- B. Fabricate and install mounting brackets, hardware, and fasteners needed to attach fire curtain assembly to building structure.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed.
 - 1. Verify related work performed under other sections is complete and in accordance with shop drawings.
 - 2. Verify wall surfaces are acceptable for installation of fire curtain system components.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Coordinate electrical interface and connection with Division 26.
- D. Coordinate interface and connection with fire and alarm system.
- E. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. Install fire curtain system components in accordance with manufacturer's installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Field Test: Follow manufacturer's cycle test procedures.
 - 1. Notify Owner's Representative, local Fire Marshal and alarm sub-contractor minimum one week in advance of scheduled testing.

2. Complete maintenance service record.

3.4 DEMONSTRATION

A. Demonstrate required testing and maintenance procedures to Owner's Representative.

END OF SECTION

SECTION 08 4013 - PROTECTIVE FRAMED GLAZING ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior protective framed glazing assembly.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- G. ITS (DIR) - Directory of Listed Products.
- H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- I. UL (DIR) - Online Certifications Directory.
- J. UL 263 - Standard for Fire Tests of Building Construction and Materials.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by each affected installer.

1.4 SUBMITTALS

- A. Product Data: Provide evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors, if any.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For glazing: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**

- a. **For steel or aluminum with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For glazing: Material Ingredient Report**
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit samples as follows illustrating each exposed metal finish of interior and exterior project-specific applications.
 - 1. For color anodized aluminum, submit minimum of three samples illustrating expected range of color in actual production.
- E. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.
- F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- G. Designer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6 MOCK-UP

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide mock-up that includes components of the types specified, and assemble to illustrate complete assembly, including attachments, anchors, and perimeter sealant.
- C. Locate on-site where directed. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F, and maintain above this minimum temperature during and for 48 hours after installation.

1.9 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 INTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

- A. Manufacturers:
 - 1. SAFTIFIRST, a division of O'Keeffe's Inc; GPX Architectural Series: www.safti.com/#sle.
 - 2. Technical Glass Products; Fireframes Designer Series: www.fireglass.com/#sle.
 - 3. Vetrotech North America; VDS 60: www.vetrotechusa.com/#sle.
- B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.
 - 1. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- C. Structural Performance: Design to support dead loads and horizontal live loads equivalent to the following; coordinate connection to main structural members.
 - 1. Design Live Loads: Comply with requirements of applicable code.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths or 3/4 inch, whichever is less, under specified design load.
- D. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with ASTM E119 or UL 263 and requirements of local authorities having jurisdiction.
 - 1. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.

2.2 COMPONENTS

- A. Framing Members: Formed steel structural members with aluminum cladding and non-combustible thermally-resistive material as required for fire rating.
 - 1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).

- B. Firestopping: As specified in Section 07 8400.
- C. Sealants Within Fire-Rated Assembly: As required by fire-rating and manufacturer's assembly.
- D. Refer to Section 07 9200 for additional information on sealant requirements.
- E. Glazing Gaskets: Type to suit application to achieve fire-rating, weather, moisture, and air infiltration requirements.
- F. **Sustainable Design Requirements:**
 - 1. **For glazing: Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **For steel and aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **For glazing: Material Ingredient Report**

2.4 DOORS AND HARDWARE

- A. Doors: Glazed aluminum.
 - 1. Finish: Same as framing.
- B. Door Hardware:
 - 1. Types: As specified in Section 08 7100.

2.5 FINISHES

- A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.
- B. Aluminum Finish: High performance organic coatings.
 - 1. Apply factory finish to surfaces that will be exposed in completed assemblies.
 - 2. Touch-up surfaces cut during fabrication so that no natural aluminum metal surfaces are visible in completed assemblies, including joint edges.
 - 3. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- C. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
- D. Color: To be selected by Architect from manufacturer's custom range.
- E. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

- A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.
- B. Install framed glazing assemblies in accordance with NFPA 80 and requirements of local authorities having jurisdiction.
- C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- D. Provide alignment attachments and shims to permanently fasten system to building structure.
- E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- F. Install door hardware using templates provided.
 - 1. See Section 08 7100 for hardware installation requirements.
- G. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch every 3 feet non-cumulative or 1/2 inch per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Refer to Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

3.5 ADJUSTING

- A. Adjust doors for smooth operation.

3.6 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

- N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
- B. **LEED Submittals: LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For storefront framing: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For steel and/or aluminum with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For storefront framing: Material Ingredient Report.**
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Samples: Submit two samples 2 x 6 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Designer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.8 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum-Framed Storefront and Doors:
 - 1. EFCO Corporation: www.efcocorp.com/#sle.
 - 2. Kawneer North America: www.kawneer.com/#sle.
 - 3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
 - 4. YKK AP America Inc: www.ykkap.com/#sle.

2.2 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Position: Centered (front to back).
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
 - 3. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.

- b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 4. Finish Color: Two color option; to match Architect's sample.
 - 5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 - 9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 - 10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 11. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
- B. Performance Requirements:
- 1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of applicable code.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 - 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
 - 3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
 - 4. Overall U-value Including Glazing: 0.38 Btu/(hr sq ft deg F), maximum.
- C. Sustainable Design Requirements:
- 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Material Ingredient Report**

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Glazing Stops: Flush.
 - 3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: As specified in Section 08 8000.
- C. Swing Doors: Glazed aluminum.

1. Finish: Same as storefront.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. Glazing Accessories: As specified in Section 08 8000.
- G. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.5 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) system.
 1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss to match sample.
 - a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - 3) Valspar; Fluoropon: www.valsparcoilextrusion.com/#sle.
- B. Color: As selected by Architect from manufacturer's custom range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.6 HARDWARE

- A. For each door, include weatherstripping.
- B. Door Hardware: As specified in Section 08 7100.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors indicated in Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.

- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Install glass in accordance with Section 08 8000, using glazing method required to achieve performance criteria.
- K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

- D. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
 - 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
 - a. Glazed Framing: Maximum allowable rate of air leakage is 0.06 cfm/sq ft.
 - b. Glazed Swinging Entrance Doors: Maximum allowable rate of air leakage is 1.00 cfm/sq ft.
- E. Repair or replace storefront components that have failed designated field testing, at contractor's expense, and retest to verify performance conforms to specified requirements.

3.5 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- J. ASTM C1401 - Standard Guide for Structural Sealant Glazing
- K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- L. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
- N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For curtain wall framing: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For steel and/or aluminum with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For curtain wall framing: Material Ingredient Report.**
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required. Submit signed and sealed shop drawings.
- D. Samples: Submit two samples 2 x 6 inches in size illustrating finished aluminum surface, and one fabrication sample as described in this section,.
- E. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure. Submit signed and sealed calculations.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Designer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.8 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Glazed Aluminum Curtain Walls:
 - 1. EFCO, a Pella Company: www.efcocorp.com/#sle.
 - 2. Kawneer North America: www.kawneer.com/#sle.
 - 3. Oldcastle Building Envelope: www.oldcastlebe.com/#sle.
 - 4. YKK AP America Inc: www.ykkap.com/#sle.

2.2 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Outside glazed, with pressure plate and mullion cover.
 - 2. Finish: Superior performing organic coatings.
 - a. Factory finish surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

- c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 - 3. Finish Color: Two color option; to match Architect's sample.
 - 4. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 7. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
 - 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set. Any steel reinforcing required inside the mullions based on the design, shall be included.
- 1. Design Wind Loads: Comply with the applicable code.
 - 2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
- 1. Test Pressure Differential: 10 psf.
- D. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
- E. Thermal Performance Requirements:
- 1. Overall U-value Including Glazing: 0.38 Btu/(hr sq ft deg F), maximum.
- F. **Sustainable Design Requirements:**
- 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **For steel and aluminum with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Material Ingredient Report**

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
- B. Glazing: As specified in Section 08 8000.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- C. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.
- D. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.
- E. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.
- F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- G. Glazing Accessories: As specified in Section 08 8000.
- H. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.5 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
 - 1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.
 - a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - 3) Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
- B. Color: To be selected by Architect from manufacturer's full range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.

- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Pressure Plate Framing: Install glazing in accordance with Section 08 8000, using exterior dry glazing method.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- C. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- D. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.

- a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
- 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
 - a. Maximum allowable rate of air leakage is 0.06 cfm/sq ft.
- E. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance conforms to specified requirements.
- F. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- G. Test Area: Perform tests on one bay at least 30 feet (9.1 m), by one story.
- H. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- I. Prepare test and inspection reports.

3.5 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 7100 - FINISH HARDWARE

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Provide all work necessary to complete all finish hardware work as shown on the drawings or inferable therefrom and/or specified herein, in accordance with the requirements of the Contract Documents.

1.2 DETAILS OF WORK:

- A. Refer to drawings, details and schedules for items requiring finish hardware. It is the intent of this section to include all finish hardware required for the project, except for items, which are specifically noted as being specified in other sections of the specifications.
- B. Coordinate the application of hardware items with door and frame details and with methods of fastening as hereinafter specified.
- C. Provide complete templates, schedules and fastening details to door and frame manufacturers and other trades requiring same, to insure doors and frames are properly cut, reinforced and prepared to receive hardware.
- D. Single source, provide only the products of one manufacturer where several manufacturers are specified for one type of hardware.
- E. Work includes, but not limited to the following items:
 - Hinges
 - Lock and latch sets
 - Deadlocks
 - Exit devices and removable mullions
 - Door closers
 - Electro-magnetic door release
 - Electro-magnetic locks
 - Power supply
 - Key switch
 - Overhead stops and holders
 - Push and pull plates
 - Kick and armor plates
 - Flush bolts
 - Floor and/or wall stops
 - Thresholds
 - Astragals
 - Weatherstripping
 - Gasketing
 - Door silencers
 - Key cabinet
- F. Work specified under other sections, including rough carpentry and items of finish hardware provided as components or accessories, include the following:
 - Hardware For:
 - Windows
 - Toilet partitions

Operable partitions
Lockers
Cabinets or casework
Roof scuttles

1.3 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Provide finish hardware in accordance with the requirements, under the published procedures of the following recognized agencies. Wherever possible all hardware and its application are intended to comply with the latest edition of CABO/ANSI A117.1, NFPA 80, NFPA 101 and NFPA 105. It is the intent of this specification that all hardware and its application shall comply or exceed the standards for labeled openings. In case of conflict between type of hardware specified and type required for fire protection, provide type required by NFPA and UL.

1.4 QUALITY ASSURANCE:

- A. All work performed and all materials provided shall be in conformity with the contract requirements.
- B. All products listed herein are intended to describe quality, type and function of items listed. Accuracy, and strict compliance with the samples and descriptive literature upon which acceptance is based, shall be the sole responsibility of this supplier.
- C. If the Architect finds materials or the finished product in which the materials are used are not in complete conformity with the contract requirements and has resulted in an inferior or unsatisfactory product, the materials shall be removed and replaced by and at the expense of the supplier.
- D. The supplier shall be responsible for the provisions, proper coordination and function of the finish hardware required for all openings.

1.5 SUPPLIER QUALIFICATIONS:

- A. The hardware supplier shall, in the opinion of the Architect, have sufficient experience and shall have an Architectural Hardware Consultant (AHC) as certified by the Door and Hardware Institute, as a full time employee of its organization. The Architectural Hardware Consultant shall be available to attend job meetings as required.
- B. After delivery of hardware and prior to its installation, the hardware consultant shall meet with the Architect and Contractor to compare final samples with actual hardware delivered. To assure acceptability, they shall review catalogs, brochures, templates, installation instructions, final hardware schedule, and shall rehearse installation, procedures and workmanship, with special emphasis on unusual conditions to ensure correct technique of installation, and coordination with other work.
- C. The hardware supplier shall maintain a warehouse and office within a fifty (50) mile radius of the job and maintain an inventory and field service staff in order to service the project properly.

1.6 SUBMITTALS:

- A. Submit, for review, six (6) complete copies of the finish hardware schedule covering complete identification of all items required for the project. Include manufacturer's names and identification of finishes. Include six (6) complete copies of catalog cuts and/or technical data sheets, identifying each item of hardware and any other data as may be required to show compliance with these specifications. The data on the shop drawings will be complete with

respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Architect to review the information as required. These schedules shall be prepared in conformity with the best practice and standards of the Door and Hardware Institute.

B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.

- 1. MR Credit 2: BPDO – Environmental Product Declarations**
 - a. For hardware: provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
- 2. MR Credit 3: BPDO – Sourcing of Raw Materials**
 - a. For recycled content hardware: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- 3. MR Credit 4: BPDO – Material Ingredients**
 - a. For hardware: provide Material Ingredient Report.**

- C. Include a separate keying schedule, which shall include Architect's door numbers, hardware headings, room description numbers and Owner's revised room description numbers as part of the final submittal of the hardware schedule. Schedule format to include an additional column to allow for Owner's revised room description numbers. Upon final approval of the keying requirements by the Architect and Owner, the Owners room numbers shall be listed in the appropriate column and resubmitted to Frederick County Public Schools for final review and approval.
- D. The Architect's review of schedules shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations or omissions from the specified requirements to provide complete hardware for the project.
- E. After approval of the hardware schedule the hardware supplier shall furnish to FCPS, four (4) complete sets of manufacturers warranties and product data.

All information will be submitted bound in a hardware schedule cover and shall contain the following information in the order as listed:

- Hardware schedule cover sheet
- Index of manufacturer's
- Manufacturers catalog cuts in the order as listed in the index
- Catalog cuts to be color coded and identified
- Warranties to be listed in order of index the supplier shall also make available to the owner
- any service manuals for locksets.

1.7 SAMPLES:

- A. In conjunction, and concurrent therewith, with the submission of the finish hardware schedule, submit to the Architect, samples of each typical item of exposed hardware in specified finish. Submission of samples prior to installation is mandatory. Architect's review of samples will be for design, pattern, finish and color only. All other requirements are the exclusive responsibility of the Contractor.
- B. Samples Required
1. Hinges, each type.
 2. Lockset with lever, SFIC cylinder.
 3. Panic device, rim type with trim.
 4. Pulls complete with mounting accessories.

5. Push plate with fasteners.
6. Surface mounted closer.
7. Overhead holder/stop
8. Floor and/or wall bumpers
9. After final review, deliver samples to job site for comparison with hardware delivered for installation. Unblemished samples may be used as part of the Work.

1.8 PRODUCT HANDLING AND STORAGE:

- A. Package and label each item of hardware separately. Tag each item in accordance with the final hardware schedule. Each package shall contain appropriate fastenings, instructions and installation templates. Protect all items from loss or damage in shipment.
- B. The General Contractor shall be responsible for receiving and providing an adequate secured storage area for all hardware. Materials shall be stored so as to assure the preservation of its quality and acceptability for the work. Locate stored material to facilitate its prompt inspection by the Architect.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Refer to hardware sets for application of individual hardware items as referenced to each opening or function.
- B. **Sustainable Design Requirements:**
 1. **Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 2. **For recycled content hardware: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 3. **Provide Material Ingredient Report.**

2.2 HARDWARE FINISHES:

- A. Produce finishes to exact match with Architect's selected samples. Variances in the color of each finish shall be minimized regardless of whether the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze. Comparative finishes shall appear the same when viewed two feet apart and three feet away. The two samples shall be under the same lighting conditions and on the same relative plane. The finish for each item of hardware shall match the finish selected for lock and latch sets. The type of finish for each hardware item is indicated in the hardware sets.

2.3 HARDWARE MOUNTING HEIGHTS:

- A. The following mounting heights shall apply throughout the work unless otherwise shown or specified and shall comply with the locations for hardware as recommended by the Door and Hardware Institute, other than as specified herewith.

1. Centerline of strike for levers	40-5/16"
2. Centerline of exit device touch pad	40"
3. Centerline of strike for dead locks	48"
4. Centerline of push plates	40"
5. Centerline of door pulls	40"

2.4 FASTENERS:

- A. Provide concealed fastenings wherever possible. The use of self-tapping or sheet metal screws is prohibited on all hardware except kick plates and push plates. All exit devices and door closers shall be through-bolt mounted.
 - 1. Concealed Fasteners: Provide hardware items complete with appropriate type and length of screws or other fastenings suitable to ensure proper application.
 - 2. Exposed Fasteners: Provide hardware with countersunk Phillips oval head type screws where concealed fastening is not possible. The finish or color of these screws shall harmonize with the product as to finish and material.

2.5 MATERIALS AND MANUFACTURERS:

- A. Acceptable manufacturers for the various items specified are listed below. Products of the underlined manufacturers are ones used in this specification to denote the quality, type, design and function of hardware required. The items of hardware as specified by manufacturer's name and product nomenclature shall comply with any additional features and/or modifications such as base material, finishes, fasteners, etc. The manufacturer and supplier shall comply with these requirements as part of their acceptance. The special features as specified supersede the manufacturer's standard product. Only equivalent products of the listed manufacturers will be accepted. Items listed with "No Substitutions" have been requested by Owner to match existing products, No alternate products will be considered for review, provide products as specified.
- B. HINGES:
 - 1. All hinges shall be of the type and size as specified and shall conform to the latest edition of ANSI/BHMA A156.1 standards and in compliance with NFPA 80 Table 2.8A. Package all hinges with machine or wood screws as required by door and frame construction.
 - 2. Hinges shall be of flush ball bearing design with flat bottom tips and non-rising pins.
 - 3. All non-ferrous type hinges shall be provided with stainless steel pins as a standard and all exterior hinges shall be stainless steel with a non-removable pin (NRP) feature per hinge.
 - 4. Where the door jamb and/or trim projects to such an extent that the width of the hinge leaf specified will not allow the door to properly clear the frame or trim, the supplier shall provide hinges of sufficient width to clear.
 - 5. Manufacturers:
 - a. Hager: BB1279, BB1168, BB1191, BB1199.
 - b. Bommer: BB5000, BB5004, BB5006.
 - c. Ives: 5BB1, 5BB1HW.
 - 6. Continuous hinges to be used at all aluminum storefront, cross-corridor, stairwell, cafeteria, gymnasium, locker room and exterior openings, and interior openings where doors are greater than 36" wide.
 - 7. Manufacturers:
 - a. Ives: 112XY, 224XY.
 - b. Hager: 780-112HD, 780-224HD.
- C. CYLINDRICAL LOCKS AND LATCHES:
 - 1. General: Lockset and latches shall be Best 9K extra-heavy-duty cylindrical series with 7-pin interchangeable core. Locks to have solid shank with no opening for access to keyed lever keeper. Lock chassis must be through-bolted outside of the lock chassis prep to prevent rotation of chassis after installation. Lock manufacturer shall provide three-year warranty, in writing, to the Owner, along with three copies of the lock service manual.
 - a. Mortise-type locksets will not be accepted except at staff corridor restroom applications designated by Owner.

2. Strikes shall be 16 gauge, curved brass, bronze, or stainless steel with a 1" deep box construction, and have sufficient length to clear trim and protect clothing.
3. Tubular Deadbolts shall have a 7-pin interchangeable core.
4. Manufacturers:
 - a. Cylindrical: Best; no substitutions.
 - 1) Lock Series: 93K7 x 15 x 626.
 - 2) Tubular Deadbolts: 83T x 626.
 - 3) Cores/Cylinders: 7-pin to match existing system.
 - b. Mortise: Schlage; no substitutions.
 - 1) Schlage: L9485BD-06A-L283-722-L583-363.

D. PANIC DEVICES:

1. General: Provide panic devices of the design, type, function and finish as specified herein.
2. All devices shall be a push through type touch pad design with return stroke fluid dampener and rubber bottoming dampers. Touch pads are to be stainless steel with no exposed rivets or screws and shall exceed height of mechanism case or rail assembly (T-Shaped) to eliminate pinch points. Plastic touchpads are not acceptable.
3. Latchbolts shall be self-lubricating and have a deadlocking feature.
4. Exit devices shall be listed by UL for accident and hazard. Devices shall conform to ANSI A156.3, Grade 1 and conform to NFPA 80 and NFPA 101.
5. All panic devices shall meet the performance tests found in the Underwriters Laboratories Standard UL305 and bear the UL listing mark for panic hardware or UL 305 and UL 10C for fire exit hardware as appropriate.
6. All exit devices shall be through bolted. All trim shall be through bolted by means of concealed fasteners.
7. A factory representative to insure proper adjustment and operation shall inspect all devices after installation. The representative shall submit a written report to the Architect with copies to the General Contractor and hardware supplier upon completion of his service. This report shall include any installation problems, noting door numbers and location along with recommendations to correct the problem.
8. Provide non-fire labeled exit devices with CDSI-cylinder-dogging security indicator feature. Dogging mechanism shall be mechanical hook type with no plastic dogging cams. Provide LD-less dogging at exterior doors as designated by Owner.
9. All surface strikes shall be roller type and come complete with a locking plate to prevent movement.
10. End caps shall be of heavy-duty metal alloy construction and provide horizontal adjustment to provide flush alignment with device cover plate. When end cap is installed, no raised edges will protrude.
11. Lever trim shall be heavy-duty type with a breakaway feature to limit damage to the unit from vandalism and fastened by means of concealed welded lugs and through-bolts from inside. Trim shall be forged brass with a minimum average thickness of .090" and have forged pulls. Provide at fire-labeled openings. Provide fail safe, electrified lever trim at stairwell doors required to lock for security purposes.
12. Provide Ives VR910 Series pulls on all non-fire labeled applications; VR910 DT or VR910 NL.
13. Provide rim exit devices at single doors. Provide two rim exit devices with keyed removable steel mullion at pairs of doors. Concealed or surface vertical rod exit devices or aluminum mullions will not be permitted except LBL-Less Bottom Latch concealed cable device may be used at double egress cross-corridor applications.
14. Provide QEL-Quiet Electric latch Retraction at electrified exit device applications.
15. Manufacturers: Panic devices
 - a. Panic Devices: Von Duprin; no substitutions.
 - 1) Exterior: XP99 Series
 - 2) Interior: 99 Series

- 3) Cross-Corridor: 9949/9949-F-LBL
- b. Mullions: Von Duprin; no substitutions.
- 1) KR4954 x 154 Stabilizers, KR9954 x 499F x 154 Stabilizers

E. OVERHEAD SURFACE CLOSER

- 1. General: Shall conform to ANSI A156.4, Grade 1, NFPA 80, NFPA 101 and UL10C.
- 2. Full rack-and-pinion type closer with non-ferrous cover and cast iron body. Double heat-treated shaft, full complement bearings, single piece forged piston, chrome silicon steel spring, non-critical screw valves; back check, sweep and latch.
- 3. ISO 9000 certified. Units stamped with date of manufacturer code.
- 4. All non-sized closer to be independent lab tested for 10,000,000 cycles.
- 5. Locate closers on interior side of exterior doors and on the non-public side of interior doors, unless otherwise specified. Closers are to be parallel arm mounted.
- 6. Closers to be non-sized, field adjustable from size 1 to 6.
- 7. Provide all non-sized closers with 1½" diameter piston.
- 8. All closers shall be mounted with through-bolts.
- 9. Provide plates, brackets, and special templates when needed for interface with particular header, door, and wall conditions and adjacent hardware.
- 10. Maximum opening force to meet ADA: Exterior doors 8.5 lb.; interior doors 5 lb.; fire doors 15 lb.
- 11. Spring Cush (SC) Arms at all exterior, Gym, Cafeteria, Stair, and high traffic openings.
- 12. Closers tested to 100 hours of ASTM B117 salt spray test, provide data on request.
- 13. Spring power adjustment aided by visible size indicator, i.e. "FAST Power Adjust".
- 14. Closers to have a stable fluid withstanding temperature range of 120 degrees to -30 degrees hydraulic fluid
- 15. Install closers at templating to provide maximum ADA compliance.
- 16. Closer products with any type of pressure relief valve system will not be acceptable.
- 17. Auto operators shall be supplied as specified in hardware set at the end of this section. Provide all labor, materials, equipment and services necessary for proper installation of a low energy, power-operated door system as defined in current ANSI/BHMA A159.19. All auto operators are to be installed by a certified LCN installation company. Provide Touchless actuators. Coordinate with access control system.
- 18. Manufacturers:
 - a. LCN; no substitutions.
 - 1) Pull Side Application: 4040XP.
 - 2) Push Side Application: 4040XP SCNS.
 - 3) Auto Operator: Senior Swing Series 9530/9540.

F. OVERHEAD HOLDERS AND STOPS:

- 1. General: Provide surface-mounted overhead holder/stop of the type, design and function as specified herein.
- 2. All holders shall be non-handed and provided complete with proper fasteners.
- 3. All holder arms and channels shall be made of extruded bronze or stainless steel.
- 4. Shock absorber to be a shock absorbing coil steel spring with a rubber insert.
- 5. Provide six bolts on all wood doors.
- 6. All products herewith shall comply with the standards of ANSI/BHMA A.156.8.
- 7. Manufacturers:
 - a. Glynn-Johnson
 - b. ABH

G. ELECTRO-MAGNETIC DOOR RELEASE:

- 1. General: Provide electromagnets hold open devices designed specifically to hold fire and smoke doors open until released under activation of the fire alarm system or loss of power.

2. Faceplates shall be stainless steel for flush or surface mounting and shall fit into standard single gang electrical boxes.
3. Assembly shall consist of an armature contact plate with adjustable pivot mounting.
4. All units to be equipped with easy wire quick insert connectors.
5. Holding force to be 25 pounds, voltage to be 24VDC, unless otherwise approved by the Architect.
 - a. Electrical Contractor shall provide all power wiring, junction boxes, conduit, recifiers, transformers, etc. This includes all connections as required to provide a complete, operational system as detailed in Division 28.
6. Manufacturers:
 - a. LCN
 - b. Rixson

H. PUSH/PULL PLATES:

1. General: Push plates and pull plates shall be provided as scheduled.
2. All plates shall be drilled and countersunk approximately 6" on centers. All plates shall be provided with stainless steel Phillip's head screws with undercut heads to insure a tight bond on any type of door. All plates shall be packaged in individual envelopes, clearly marked and sized. All material shall be properly packaged to protect the finish.
3. All products shall comply with ANSI/BHMA standards A156.6 and A156.18.
4. All push and pull plates shall have radius corners.
5. All push plates shall be a minimum thickness .125.
6. All pull plates shall be a minimum thickness .050.
7. Manufacturers:
 - a. Ives
 - b. Trimco
 - c. Burns

I. KICK AND ARMOR PLATES:

1. General: All kick plates and armor plates shall be .050 inch minimum thickness stainless steel, US32D. Plates to be beveled three edges (B3E), drilled and countersunk with stainless steel screws 5/8" minimum with matching finish.
2. All plates shall be in compliance with ANSI/BHMA standards A156.6 and A156.18.
3. Manufacturers:
 - a. Ives
 - b. Trimco
 - c. Burns

J. MANUAL FLUSH BOLTS AND COORDINATORS:

1. General: All flush bolts are to be manually operated and provided for pairs of doors as specified. Provide minimum length of 12" for all rods, except where any door is higher than 7'-0", provide the top bolt in a length sufficient to locate the flush bolt operator no more than 6'-0" above the finished floor. Comply with ANSI A115.4, door and frame preparation and ANSI/BHMA A156.16. Provide standard strikes with wrought boxes for top bolts. Provide dustproof strikes for bottom bolts. Coordinators are to be used only on hollow metal doors.
2. Manufacturers:
 - a. Ives
 - b. Trimco
 - c. Burns

K. DUSTPROOF STRIKES:

1. Floor Strikes: For 5/8" round or 1/2" square bolts.
2. Manufacturers:

- a. Ives
- b. Trimco
- c. Burns

L. FLOOR AND WALL STOPS:

- 1. General: Provide floor and/or wall stops as indicated, unless otherwise specified.
- 2. Manufacturers:
 - a. Ives
 - b. Trimco
 - c. Burns

M. THRESHOLDS:

- 1. General: Provide thresholds of the type, finish and material as specified.
- 2. Fasteners shall be of stainless steel or non-ferrous material with a finish compatible with the threshold. The length of the screw used should be the proper length to allow for a minimum of 3/4" thread engagement in the floor or anchoring device used.
- 3. All material shall be in compliance with ANSI/BHMA standards A156.21.
- 4. All aluminum extrusions are to be of alloy 6063 hardness T-5.
- 5. Manufacturers:
 - a. Zero
 - b. National Guard Products
 - c. Reese

N. WEATHERSTRIPPING, GASKETING AND ASTRAGALS:

- 1. General: Provide all gasketing, door bottoms and astragals as specified.
- 2. Wherever the specified materials are used in conjunction with a fire rated opening, products shall have been tested in accordance with the Underwriters Laboratories, UL10C and shall meet the requirements of positive pressure UBC 7-2.
- 3. All gasketing material shall be silicone and in compliance with ANSI/BHMA standard A156.22 for door gasketing systems.
- 4. Manufacturers:
 - a. Zero
 - b. National Guard Products
 - c. Reese

O. DOOR SILENCERS:

- 1. Provide for all hollow metal frames, three door silencers for each single door and two each for each pair of doors.
- 2. Manufacturers:
 - a. Ives
 - b. Rockwood
 - c. Hager

P. KEY CONTROL SYSTEM:

- 1. General: Provide a complete key system of the type specified.
- 2. Provide key cabinet made of cold rolled, minimum 18-gauge furniture steel electro-welded. Doors shall have continuous brass pin piano type hinge and shall be equipped with chrome-plated locking handles, hook cam and two paracentric keys. All locks shall be nickel plated with solid brass pin tumbler cylinder keyed as directed. Key cabinet and key control system shall accommodate all keys for this project plus fifty percent expansion.
 - a. Key tags shall consist of two sets: Permanent self-locking and loan key snap hook type with tag colors as follows: Red fiber markers of the permanent self-locking type approximately 1-1/4" inch in diameter on, which shall be engraved the legend, "File Key Must Not Be Loaned."

- b. Also furnish for each hook a white cloverleaf key marker with snap hooks on which shall be engraved "Loan Key."
3. The hardware supplier shall attach a key tag to each change key and shall mark thereon the respective architectural key symbol and key biting number. Each group of keys shall be contained in a key gathering envelope, which shall include the architectural key symbol, key biting number and architectural room description number.
4. The hardware supplier shall be responsible for properly identifying and tagging all change keys, setting up the key cabinet and key index system.
5. The Contractor shall be responsible for verifying that all locksets are installed in their proper location and that the key changes operate the correct locks.
 - a. Key Index System Shall Include:
 - 1) Hook number
 - 2) Architectural key symbol
 - 3) Architectural door number
 - 4) Owner's revised room number
 - 5) Key biting number
6. The hardware supplier shall include in their scope of work all labor necessary to completely layout the key index system and install all keys, properly identified in the key cabinet. The permanent keys and key cabinet shall be delivered directly to the Owner.
7. The key cabinet shall be a three-way cross index system and shall include a hardbound copy and disk, including master key listing the keys alphabetically, the hooks numerically and the key biting changes numerically. Attach the keys to the two sets of numbered tags supplied with the cabinet, permanent tag and the loan key tags. The supplier shall instruct the Owner in use of the system. The General Contractor shall install the cabinet in a location selected by the Owner.
8. Manufacturers:
 - a. Telkee: Aristocrat AWC-450-S System; size of system is minimum requirement, appropriate size to be provided dependent on project.

Q. KEYS AND KEYING:

1. Provide Best brass construction cores and keys during the construction period. Plastic construction cores will not be permitted. Construction cores shall not be part of the Owner's permanent keying system or provided on the same keyway or key section as the Owner's permanent keying system.
2. Permanent Best cores and keys shall be prepared according to the approved keying schedule and shall be furnished to the Owner by the local Best factory representative prior to occupancy.
3. All cylinders and cores shall be Best 7-pin, interchangeable core. Provide Best "Premium" cores at all exterior keyed openings. Best cores shall be keyed by the factory to match the existing Frederick County Public School key system.
4. Permanent Best keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Duplication Prohibited."
5. Grand Masterkeys, Masterkeys and other Security keys shall be transmitted to the Owner by Registered Mail, return receipt requested.
6. Furnish keys in the following quantities:
 - a. 4 each Grand Masterkeys
 - b. 4 each Masterkeys per set
 - c. 4 each Change keys each keyed core
 - d. 9 each Construction Masterkeys
 - e. 1 each Construction Control key
7. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Contractor's Hardware Supplier. All Construction cores and keys remain the property of the Contractor's Hardware Supplier.

R. ACCESS CONTROL SYSTEM

1. Manufacturer: Best; no substitutions.

S. ELECTRIC STRIKES

1. Manufacturer: Von Duprin; no substitutions.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL:

- A. The Contractor shall receive all hardware for doors as shown and scheduled and as in accordance with the approved hardware schedule.
- B. Provide an adequate and secured storage area for all hardware; refer to paragraph 1.09.
- C. Install all hardware in strict accordance with the manufacturer's templates and installation procedures and workmanship.
- D. The Contractor shall turn over to the Owner any tools supplied with the hardware to adjust or maintain the hardware.
- E. In conjunction with the hardware supplier, the Contractor shall adjust and check the installation of hardware prior to acceptance by the Owner and/or Architect.
- F. The Contractor shall obtain a copy of ANSI/DHI A115.IG-1994. "Installation Guide for Doors and Hardware." It is the intent of this document to be used as a reference guide in the proper handling, storage and installation of finish hardware and doors and frames. This document can be obtained through the Door and Hardware Institute, Chantilly, VA.
- G. All hardware shall be inspected by the factory representative prior to final acceptance by FCPS to ensure proper installation and adjustment. The representative shall submit a written report to the Architect with copies to the Contractor and hardware supplier upon completion of his service. This report shall include any installation problems, noting door numbers and location along with recommendations to correct the problem.
- H. The Contractor and construction manager shall coordinate a pre-installation meeting with the hardware installers, the hardware supplier, and manufacturers' representative to review products specified and their proper installation.

3.2 ELECTRONIC ACCESS CONTROL SYSTEM REQUIREMENTS:

- A. Summary of Work: The hardware supplier shall obtain the services of Best Access Systems to provide the hardwire Electronic Access Control System (EAC) under this Section. The EAC system shall be tied into Frederick County Public Schools (FCPS) existing BASIS Access Control Software System. Through the hardware supplier, electrical contractor shall provide all labor, material and services necessary to install a complete EAC system. Note, regardless of door and frame material, the EAC system shall be included in the hardware supplier scope of work. No deviations will be allowed. Card Readers shall be provided at all exterior doors and select interior doors as indicated on the drawings.
- B. Access Control System Equipment Requirements:
 1. Furnish the following:

- a. One (1) Intelligent System Controller / Network Device / Communication Cable & Enclosure # BAS-2220 x LS-MSS100-1 x HOC-ETHLAN.
 - b. Minimum of five (5) Proximity Car Reader HID 910NNNNEK2037P (Black) per school.
 - c. Minimum of three (3) Dual Reader Interface Module BAS-1320 per school.
 - d. Minimum of one (1) "UL" listed Power Supplies & Enclosure BAS-AL600ULM x ABT-12 per School.
 - e. Wiring requirements are 18 gauge, 4 paired, (8 wire) twisted, shield, plenum rated "UL" listed. Note: Wire shall be provided and installed by electrical contractor. The Electrical Contractor shall provide conduit as required.
 2. Above quantities may vary as equipment shall be configured and engineered to suit overall system requirements.
- C. Hardware Requirements and Door Application:
1. Provide electrified hardware as specified in hardware schedule. All electrified hardware shall be interfaced with the EAC system, and be connected to the emergency generator. Regardless of door and frame material, electrified hardware shall be included in the hardware supplier scope of work.
- D. Power and Network Requirements:
1. As necessary, the Electrical Contractor responsible for Division 16 shall provide switched 120V power, conduit and junction boxes at each card reader location and in the Server/Telecom room for EAC equipment. General Contractor shall be responsible for providing a network drop at the Server/Telecom room. FCPS shall provide a dedicated IP address to security integrator before EAC system start up. EAC system consisting of card reader system and electrified hardware controlled by card access shall be tied into the emergency generator back up system. In addition, provide battery back up at Door 000B (Main Entry). Prior to installation, coordinate final location of card readers and access control equipment with FCPS.
- E. Owner Provided:
1. Proximity cards shall be furnished and programmed by FCPS.

3.3 **HARDWARE SCHEDULE**

A. **MANUFACTURER LIST:**

CODE	NAME
BE	Best Access Systems
BEST	BEST
BY	By Others
DM	Dorma Door Controls
GL	Glynn Johnson
HA	Hager
HID	HID Global Corporation
IV	Ives
LC	LCN Closers
LO	Locknetics
LX	Locinox
NA	National Guard
RCIN	Rutherford Controls Int'l Corp
SC	Schlage
SDCC	Security Door Controls
TECT	Tectus by Simonswerk
TR	Trimco
VO	Von Duprin
ZI	Zero International

B. **HARDWARE LIST:**

MFR	DESCRIPTION	PRODUCT NUMBER	FINISH
BE	Lockset	9K3-7D15D L/C 7/8"LTC	626
	Lockset	9K3-7D15D L/C S3	626
	Lockset	9K3-7D15D L/C S3 TL/O	626
	Lockset	9K3-7R15D L/C S3	626
	Lockset	9K3-7W15D L/C S3	626AM
	Lockset	9K3-7YD15D L/C 7/8"LTC	626
	Passage Set	9K3-0N15D S3	626
	Core	Match FCPS Standard Cores	626
	Mortise Cylinder	1E-74 L/C	626
	Rim Cylinder	12E-72 L/C	626
	Lockset	45H-7XR14H	630
	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER	
	Meeting Stile Seal	By Alum. Door Mfg.	
DM	Overhead Stop	911 S	689
GL	Overhead Door Holder	101H	US32D
	Overhead Stop	101S	US32D
HA	Hinge	BB1191 4 1/2 X 4 1/2	US32D
	Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D
	Hinge	BB1199 4 1/2 X 4 1/2	US26D
	Hinge	BB1199 4 1/2 X 4 1/2	US32D
	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D
	Hinge	BB1199 5 X 4 1/2	US32D

MFR	DESCRIPTION	PRODUCT NUMBER	FINISH
	Hinge	BB1199 5 X 4 1/2 NRP	US32D
	Hinge	BB1279 4 1/2 X 4 1/2	US26D
	Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D
	Continuous Hinge	661HD UL 87"	CLR
	Continuous Hinge	661HD UL 87" EPT Prep	CLR
	Continuous Hinge	780-224HD 83"	CLR
	Continuous Hinge	780-224HD 83" EPT/PREP	CLR
	Continuous Hinge	780-224HD 83" EPT/PREP UL/FF	CLR
	Continuous Hinge	780-224HD 83" UL/FF	CLR
	Continuous Hinge	780-224HD 93"	CLR
	Continuous Hinge	780-224HD 93" EPT/PREP	CLR
HID	Card Reader	9910NNNNEK2037P	
IV	Vandal Resistant Pull	VR910DT	US32D
	Vandal Resistant Pull	VR910NL	US32D
LC	Closer	4040 XP EDA	AL
	Closer	4040 XP REG	AL
	Closer	4040 XP SCUSH 30 SHOE SUPPORT	AL
		4040-18 61 STOP SPACER	
	Closer	4040 XPT STD MC TORX SCREWS	AL
LO	Push Button	MPB100	
LX	Hydraulic Closer	MAMMOTH180	RAL 9005
NA	Astragal	139 SP	
	Door Sweep	200 NA	
	Drip Cap	16 A 4"ODW	
	Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"	
	Finger Guard	2248 A 82" SMS-TEKS 8 X 3/4" TORX SECURITY SCREWS 8 X 3/4"	
	Gasketing	5050 C-20 20'	
	Gasketing	5050 C-21 21'	
	Mullion Seal	5100 S	
	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"	
	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"	
	Threshold	896HD N 36" 10-24 SSMS/LA	AL
	Threshold	896HD N 48" 10-24 MS/LA	AL
	Threshold	896HD N 72" 10-24 SSMS/LA	AL
	Threshold	896HD NDKB 36" 10-24 SSMS/LA	
	Threshold	896HD NDKB 72" 10-24 MS/LA	
RCIN	Door Position Switch	9540	WHITE
SC	Lockset	L9485B 06A L283-722 L583-363	630
	Magnetic Lockset	GF3000	
SDCC	Mini Console	DTMO-1	BEIGE
TECT	Weather-stripping By Alum Manf.	BY OTHERS	
TR	Flush Bolt	3917-12	626
	Set Auto Flush Bolts	3810 X 3810	626
	Door Pull	1191-4 CTC	630
	Coordinator	3094B2	BLACK
	Armor Plate	KA050 32" x 35" B4E-HEAVY-AP CSK-AP	630
	Kick Plate	KO050 10" x 1" LDW B4E CSK	630
	Kick Plate	KO050 10" x 2" LDW B4E CSK	630
	Mop Plate	KM050 4" x 1" LDW B4E CSK	630

MFR	DESCRIPTION	PRODUCT NUMBER	FINISH
	Push Plate	1001-3	630
	Floor Stop	1211	626
	Wall Bumper	1270CV	622
	Wall Bumper	1270CX	626
	Wall Bumper	1270WX	630
	Coat Hook	3072	619
	Coat Hook	3072	630
	Door Viewer	976U	625
	Door Viewer Cap	976CV	605
	Dustproof Strike	3910	630
	Filler Bar	3094-2	BLACK
	Lock Guard	5001	630
	Mounting Bracket	3095 or 3096 Mounting Bracket	BLACK
	Door Silencers	1229A	BLACK
VO	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28
	Exit Device	CDSI 9947EO	US26D
	Exit Device	CDSI 9947L-NL x 996L-NL-R&V	US26D
	Exit Device	LD 98L-NL x 996L-NL-R&V 06-SS 299	US26D, US32D
	Exit Device	LD 9947WDC-EO LBR	US26D
	Exit Device	LD 99L-BE-F x 996L-R&V-BE 06	US26D
	Exit Device	LD 99L-DT x 996L-DT	US26D
	Exit Device	LD 99L-NL x 996L-NL-R&V	US26D
	Exit Device	LD QEL 99L-NL x 996L-NL-R&V 06 24VDC FSE	US26D
	Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D
	Exit Device	LD XP99EO	US26D
	Exit Device	LD XP99L-NL x 996L-NL-R&V	US32D, US26D
	Fire Exit Device	QEL XP99L-NL-F x 996L-NL-R&V 24VDC FSE	US32D, US26D
	Fire Exit Device	XP99EO-F	US26D
	Electric Strike	4212 S024	630
	Electric Strike	6211 24VAC CON EB FSE S024	US32D
	Electric Strike	6224 24VAC FSE SHIM	US32D
	Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT	
	Power Transfer	EPT 10 CON	SP28

C. OPTIONS LIST:

CODE	DESCRIPTION
4	1-3/4" Door Thickness
B	PICK & DRILL RESISTANT (1CD only)
W	WEAR RESISTANT
06	06 LEVER DESIGN-FURNISHED STANDARD
EB	Entry Buzzer for Fail-Secure
LD	LESS DOGGING

CODE	DESCRIPTION
MC	METAL COVER
S3	ANSI Strike Package
299	STANDARD SURFACE STRIKE - DULL BLACK
CON	Molex Electrical Connector (6100/6200)
CON	Molex Electrical Connector (EPT 10)
CSK	COUNTER SINKING OF KICK and MOP PLATES
CTC	Measured Center-To-Center
FSE	FAIL SECURE
FSE	FAIL SECURE-FOR ELECTRIC UNLOCKING
LBR	Less Bottom Rod for 3/35/98/9947
QEL	Quiet Electric Latch Retraction
CDSI	CYLINDER DOGGING WITH INDICATOR
S024	Rectifier Kit - 24VAC to 24VDC
SHIM	SHIM FOR 6111/6113 BLADE STOP APPL.
TL/O	TACTILE LEVER - Outside
06-SS	06 STAINLESS LEVER DESIGN
24VAC	24VAC-VOLTAGE WITH RECTIFIER KIT
24VDC	24 VOLTS DC
UL/FF	UL FIRE RATING
900-8F	8 Fuse Protected Outputs
900-8P	8 PTC Protected Outputs
CSK-AP	COUNTER SINKING OF ARMOUR PLATES
4040-18	Drop Plate
7/8"LTC	7/8" Lip-To-Center Strike
900-2RS	2 Relay Board Output
900-4RL	4 Relay Board Output Integrated Logic
900-BAT	Batteries Only (Qty 2)
EPT/PREP	POWER TRANSFER PREP - CONCEALED MODELS
KEYWAY -	Keyway (Specify)
L283-722	Vacant/Occupied Indicator(Outside of Dr)
L583-363	DISABILITY T/TURN (Replaces XL11-800)
10-24 MS/LA	10-24 MACHINE SCREW/LEAD ANCHOR
TORX SCREWS	TORX SCREW PACK
B4E-HEAVY-AP	BEVELED 4 EDGES - ARMOR PLATES
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
10-24 SSMS/LA	STAINLESS MACHINE SCREWS/LEAD ANCHOR
61 STOP SPACER	BLADE STOP SPACER-PAINTED FINISHES
30 SHOE SUPPORT	CUSH SHOE SUPPORT-PAINTED FINISHES
Less Strike Prep	Blank Mullion - Less Strike Prep
SMS-TEKS 6 X 3/4"	SELF DRILLING SCREWS 6 X 3/4"
SMS-TEKS 8 X 3/4"	SELF DRILLING SMS 8 X 3/4"
154 STABILIZER KIT	Mullion Stabilizer Kit (Steel Mullions)
TORX SECURITY SCREWS 8 X 3/4"	TORX SECURITY SCREWS 8 X 3/4"

FINISH LIST:

CODE	DESCRIPTION
AL	Aluminum
AL	Aluminum (BHMA 689)

605	Bright Brass, Clear Coated
619	Satin Nickel Plated, Clear Coated
622	Flat Black Coated
625	Bright Chromium Plated
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
CLR	Clear Anodized
SP28	Lacquer Sprayed Aluminum
626AM	Satin Chrome - Antimicrobial Coating
BEIGE	Beige
BLACK	Black
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull
WHITE	White
RAL 9005	Powder-coated Aluminum
315	Black

D. HARDWARE SETS:

EXTERIOR DOORS

SET #X1 – Double Leaf; Access Controlled; Egress

Doors: 001, 002A (Add/Alternate), 005, 006, 017, 026

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD XP99EO	US26D	VO
1	Exit Device	LD QEL XP99EO 24VDC FSE	US32D, US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Wiring Diagram	Furnished By HWDE. Supplier		BY
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Mullion Seal	5100 S		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #X1.1 – Double Leaf; Access Controlled; Egress; Knox Box

Doors: 000B

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD XP99EO	US26D	VO
1	Exit Device	LD QEL XP99EO 24VDC FSE	US32D, US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Rim Cylinder	12E-72 L/C	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID

1	Power Supply	PS904 900-2RS 900-BBK-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Mullion Seal	5100 S		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #X1.2 – Double Leaf; Egress

Doors: 000A

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2	Exit Device	LD XP99EO	US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Mullion Seal	5100 S		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA
2	Door Contact			

SET #X1.3 – Double Leaf; Access Controlled; Egress

Doors: 008, 011, 018, 019, 024, 025

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD XP99EO	US26D	VO
1	Exit Device	LD QEL XP99EO 24VDC FSE	US32D, US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO

1	Power Transfer	EPT 10 CON	SP28	VO
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA
1	Drip Cap	16 A 4"ODW		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #X1.4 – Single Leaf; Access Controlled; Egress; Electrical Room

Doors: 013

1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Exit Device	LD QEL XP99LEO 24VDC FSE	US32D, US26D	VO
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Drip Cap	16 A 4"ODW		NA
1	Gasketing	5050 C-20 20'		NA
1	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"		NA
1	Threshold	896HD N 48" 10-24 MS/LA	AL	NA

SET #X1.5 –Single Leaf; Access Controlled, Egress

Doors: 002B, 003

1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Exit Device	LD QEL XP99LEO 24VDC FSE	US32D, US26D	VO
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Power Supply	PS904 900-2RS		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Drip Cap	16 A 4"ODW		NA
1	Gasketing	5050 C-20 20'		NA
1	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"		NA
1	Threshold	896HD N 48" 10-24 MS/LA	AL	NA

SET #X1.6 –Single Leaf; Egress

Doors: 020, 023

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Exit Device	LD XP99EO	US26D	VO
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Door Position Switch	9540	WHITE	RCIN
1	Drip Cap	16 A 4"ODW		NA
1	Gasketing	5050 C-20 20'		NA
1	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"		NA
1	Threshold	896HD N 48" 10-24 MS/LA	AL	NA

SET #X1.7 –Single Leaf; Access Controlled; Egress

Doors: 004, 016

1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Exit Device	LD QEL XP99EO 24VDC FSE	US32D, US26D	VO
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Weatherstripping	By Alum. Door Mfg.		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"		NA
1	Threshold	896HD N 48" 10-24 MS/LA	AL	NA

SET #X1.8 –Single Leaf; Access Controlled; Egress

Doors: 021

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD XP99EO	US26D	VO
1	Exit Device	LD QEL XP99EO 24VDC FSE	US32D, US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Rim Cylinder	12E-72 L/C	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC

2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS 900-BBK-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Mullion Seal	5100 S		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #X3 – Double Leaf; Access Controlled

Doors: 007, 010, 012

1	Continuous Hinge	780-224HD 93" EPT/PREP	CLR	HA
1	Continuous Hinge	780-224HD 93"	CLR	HA
1	Flush Bolts (Set)	3810 X 3810 Manual or Constant Latch	626	TR
1	Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Electric Strike	6211 24VAC CON EB FSE S024	US32D	VO
1	Coordinator	3094B2	BLACK	TR
2	Closer	4040 XP EDA 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Overhead Stop	911 S	689	DM
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
2	Mounting Bracket	3095 or 3096 Mounting Bracket	BLACK	TR
1	Dustproof Strike	3910	630	TR
1	Drip Cap	16 A 4"ODW		NA
1	Astragal	139 SP		NA
2	Gasketing	5050 C-21 21'		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #X4 – Single Leaf; Access Controlled

Doors: 009, 014, 022

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Electric Strike	6400 24VAC CON EB FSE S024	US32D	VO
1	Closer	4040 XP EDA 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC

1	Overhead Door Stop	101S	US32D	GL
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Lock Guard	5001	630	TR
1	Card Reader	9910NNNNEK2037P		HID_
1	Power Supply	PS904 900-2RS-KL		VO
1	Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"		NA
1	Gasketing	5050 C-21 21'		NA
1	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #X6 – Single Leaf; Roof Access

Doors: 027, 028A, 028B, 029, 030, 031

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7W15D L/C S3	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Overhead Door Stop	101S	US32D	GL
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Door Position Switch	9540	WHITE	RCIN
1	Lock Guard	5001	630	TR
1	Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"		NA
1	Gasketing	5050 C-21 21'		NA
1	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #X7 – Single Leaf; Playground Gate

Doors: PG01, PG02, PG03, PG04, PG05

1	Hydraulic Closer	MAMMOTH180	RAL 9005	LX
1	Exit Device	XP99EO-WH	315	VO
1	Rim Cylinder	12E-72 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV

INTERIOR DOORS

SET #N1 – Single Leaf; Classrooms

Doors: A101, A102, A106, A108, A109, A110, A111, A113, A114, A118, A119, A201, A202, A203, A207, A209, A210, A211, A212, A214, A215, A219, A220, A221, B104, B105, B109, B113, B202, B203, B204, C102E, E110, E117, E120, E122, E123, E127, E131 (Add/Alternate), E132 (Add/Alternate), F101, F102, F106, F107, F109, F110, F111, F112, F114, F118, F119, F201, F202, F203, F207, F208, F210, F211, F212, F213, F215, F219, F220, F221

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.1 – Single Leaf; Office

Doors: A205, A206, B101A, B101D, B106, B107, B108, B111, B205, B206, B207, B208, B209, B211, B212, B213, C105, C106A, C110, D104, E103B, E104, E105, E106, E107, E108, E109, E113, E113A, E113B, E118, E121, E134 (Add/Alternate), E136 (Add/Alternate), F216, F217

3	Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.2 – Single Leaf; STEM Classroom from Media Center

Doors: B101C

3	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP EDA	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.3 – Single Leaf; Health Clinic

Doors: E102C

3	Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE

1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	622	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.4 – Double Leaf; Platform

Doors: C101E

6	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Flush Bolts	3810 X 3810 Constant Latch	626	TR
1	Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Coordinator	3094B2	BLACK	TR
2	Closer	4040 XP REG	AL	LC
2	Overhead Door Stop	101S	US32D	GL
1	Dustproof Strike	3910	630	TR
1	Filler Bar	3094-2	BLACK	TR
1	Astragal	139 SP		NA
2	Door Silencers	1229A	BLACK	TR

SET #N1.5 – Single Leaf; Platform Ramp

Doors: C101C

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	9K3-7R15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.6 – Single Leaf; Classroom

Door: E103

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP rw/PA	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N1.7 – Single Leaf; Office

Door: E112B

3	Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE

1	Electric Strike	6400	630	VO
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N2 – 96”H Double Leaf; Gymnasium Storage

Doors: D103

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Flush Bolts (Set)	3810 X 3810 Manual or Constant Latch	626	TR
1	Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP REG	AL	LC
2	Overhead Door Holder	101H	US32D	GL
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Dustproof Strike	3910	630	TR
1	Astragal	139 SP		NA
2	Gasketing	5050 C-20 20'		NA
2	Door Sweep	200 NA		NA
1	Threshold	896HD N 72" 10-24 SSMS/LA	AL	NA

SET #N2.1 – Double Leaf; Rated Barrier; Gymnasium Furniture Storage

Doors: D101A

6	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Flush Bolts (Set)	3810 X 3810 Constant Latch	626	TR
1	Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Coordinator	3094B2	BLACK	TR
2	Closer	4040 XP REG	AL	LC
2	Overhead Door Stop	101S	US32D	GL
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Dustproof Strike	3910	630	TR
1	Filler Bar	3094-2	BLACK	TR
1	Astragal	139 SP		NA
2	Door Silencers	1229A	BLACK	TR

SET #N3 – Single Leaf; Gymnasium Group Restroom

Doors: D102A, D102B

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Door Pull	1191-4 4 CTC	630	TR
1	Closer	4040 XP EDA	AL	LC

1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Push Plate	1001-3	630	TR
1	Floor Stop	1211	626	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N4 – Single Leaf; Staff Restroom/Lockers; Controlled Access

Doors: A104, E126, F116, E133 (Add/Alternate)

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	L9485H 06A L283-722	630	SC
1	Core (Permanent)	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Coat Hook	3072	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N4.1 – Single Leaf; Staff Restroom/Lockers; Controlled Access

Doors: A204B, C103A, C110A, C110B, D104A, E103C, E111, E114, E115, F218A

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	L9040B 06A L283-722	630	SC
1	Core (Permanent)	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Coat Hook	3072	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N6 – Double Leaf; Egress; Gym/Cafeteria

Doors: C100C, D100A

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2	Exit Device	CDSI 99E0	US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N6.1 – 48"W Single Leaf; Music Classroom

Doors: C111, C112

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N6.2 – Double Leaf; Cafeteria Serving Lines

Doors: C102A, C102B, C102C, C102D

6	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
2	Flush Bolt	3917-12	626	TR
1	Deadbolt	L460H-L283-711	626	BE
1	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Overhead Door Holder	101H	US32D	GL
2	Push Plate	1001-3	630	TR
2	Door Pull	1191-4 CTC	630	TR
2	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Dustproof Strike	3910	630	TR
1	Astragal	139 SP		NA
2	Door Silencers	1229A	BLACK	TR

SET #N6.3 – Double Leaf; Egress; Media Center Entrance

Doors: B101

2	Continuous Hinge	780-224HD 83"	CLR	HA
2	Exit Device	CDSI 99EO	US26D	VO
1	Mullion	KR4954	689	VO
1	Rim Cylinder	12E-72 L/C	626	BE
3	Mortise Cylinder	1E-74 L/C	626	BE
4	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT

SET #N6.4 – Single Leaf; Egress; Media Center/Multipurpose

Doors: C100B, E124B

3	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Exit Device	CDSI 99E0	US26D, US32D	VO
1	Vandal Resistant Pull	VR910NL	US32D	IV
1	Core	Match FCPS Standard Cores	626	BE
1	Rim Cylinder	12E-72 L/C	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Floor Stop	1211	626	TR
1	Gasketing	5050 C-20 20'		NA

SET #N6.5 – Double Leaf; Egress; Gymnasium

Door: D101B

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2	Exit Device	CDSI 99E0	US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
3	Mortise Cylinder	1E-74 L/C	626	BE
4	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP H SCNS	AL	LC
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N6.6 – Double Leaf; Egress; Gymnasium

Door: D101C

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2	Exit Device	CDSI 99E0	US26D	VO
2	Mortise Cylinder	1E-74 L/C	626	BE
3	Core	Match FCPS Standard Cores	626	BE
2	Vandal Resistant Pull	VR910DT	US32D	IV
2	Closer	4040 XP H SCNS	AL	LC
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N6.7 – Double Leaf; Egress; Multipurpose Room

Door: E124A

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO

1	Exit Device	CDSI 99EO	US26D	VO
1	Exit Device	LD 99EO	US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
2	Mortise Cylinder	1E-74 L/C	626	BE
3	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCNS	AL	LC
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N7 – Double Leaf; Egress; Rated Enclosure

Doors: A112, A208, E100B, F108, F214

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR9954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	99L-BE-F x 996L-R&V-BE 06	US26D	VO
1	Exit Device	99EO-F	US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Core (Permanent)	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Magnetic Wall Holder			
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N7.1 – Double Leaf; Egress; Rated Enclosure

Doors: C101, C101A, C101B

2	Continuous Hinge	780-224HD 83"	CLR	HA
1	Mullion	KR9954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2	Exit Device	99L-F-2SI	US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Rim Cylinder	12E-72 L/C	626	BE
3	Core (Permanent)	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Magnetic Wall Holder			LC
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
2	Gasketing	5050 C-21 21'		NA
1	Mullion Seal	5100 S		NA

SET #N7.2 – Double Leaf; Controlled Access; Egress; Rated Enclosure

Doors: A213, F209

1	Continuous Hinge	780-224HD 83" EPT/PREP UL/FF	CLR	HA
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1	Continuous Hinge	780-224HD 83" UL/FF	CLR	HA
1	Mullion	KR9954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Fire Exit Device	E XP99L-F x E996L-R&V 24VDC FSE	US32D, US26D	VO
1	Fire Exit Device	XP99EO-F	US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
2	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
1	Mullion Seal	5100 S		NA
2	Gasketing	5050 C-21 21'		NA

SET #N8 – Double Leaf; Controlled Access; Egress; Knox Box Access

Doors: B110, E101B

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD QEL 99EO 06 24VDC FSE	US26D	VO
1	Exit Device	LD 99EO	US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-BBK-KL		VO
1	Power Transfer	EPT 10 CON	SP28	VO
2	Door Position Switch	9540	WHITE	RCIN
1	Mullion Seal	5100 S		NA
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weatherstripping	By Alum. Door Mfg.		TECT

SET #N8.1 - Double Leaf; Egress

Doors: E101A

2	Continuous Hinge	661HD UL 87"	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO

2	Exit Device	LD 99EO	US26D	VO
1	Mortise Cylinder	1E-74 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Weatherstripping	By Alum. Door Mfg.		TECT
1	Mullion Seal	5100 S		NA
2	Meeting Stile Seal	By Alum. Door Mfg.		BY

SET #N8.2 – Single Leaf; Egress; Controlled Access

Doors: E100C (Add/Alternate)

3	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Exit Device	QEL 99EO	US26D, US32D	VO
1	Vandal Resistant Pull	VR910NL	630	IV
1	Rim Cylinder	12E-72 L/C	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP EDA	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-20 20'		NA
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1	Power Transfer	EPT 10 CON	SP28	VO

SET #N8.3 – Double Leaf; Egress

Doors: E112A

2	Continuous Hinge	661HD UL 87"	CLR	HA
2	Dummy Touch Bar	330	US26D	VO
2	Vandal Resistant Pull	VR910DT	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Weatherstripping	By Alum. Door Mfg.		TECT
2	Meeting Stile Seal	By Alum. Door Mfg.		BY

SET #N9 – Single Leaf; Kitchen Locker Room

Doors: C103

3	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR

1	Coat Hook	3072	619	TR
1	Gasketing	5050 C-21 21'		NA

SET #N10 – Single Leaf; Stair to Penthouse

Doors: C201

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7W15D L/C S3	626AM	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61AL SPACER		LC
1	Overhead Door Stop	101S	US32D	GL
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Door Position Switch	9540	WHITE	RCIN
1	Gasketing	5050 C-20 20'		NA
1	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #N10.1 – Single Leaf; Penthouse Stair

Doors: C101D, C109

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7D15D L/C S3	626AM	BE
2	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA
1	Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #N10.2 – Single Leaf; Educational Storage Room (Smoke Seal from Corridor)

Doors: A103, A204, B102, B103, B112, F117, F218

3	Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N10.3 – 48"W Single Leaf; Music Storage

Doors: C111A, C112B

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE

1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	BLACK	TR

SET #N10.4 – Single Leaf; Rated Enclosure; Maintenance Storage

Doors: C106

3	Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Floor Stop	1211	626	TR
1	Gasketing	5050 C-20 20'		NA
1	Door Sweep	200 NA		NA
1	Threshold	896HD N 36" 10-24 SSMS/LA	AL	NA

SET #N10.5 – Double Leaf; Cafeteria Furniture Storage

Doors: C101F

6	Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
2	Flush Bolt	3917-12	626	TR
1	Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1	Core	Match FCPS Standard Cores	626	BE
2	Closer	4040 XP REG	AL	LC
2	Overhead Door Holder	101H	US32D	GL
2	Armor Plate	KA050 32" x 35" B4E-HEAVY-AP CSK-AP	630	TR
1	Floor Stop	1211	626	TR
1	Wall Bumper	1270WX	630	TR
1	Dustproof Strike	3910	630	TR
1	Astragal	139 SP		NA
2	Door Silencers	1229A	BLACK	TR

SET #N10.6 – Single Leaf; Mechanical Room

Doors: C107

3	Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3 TL/O	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N10.7 – Single Leaf; Elevator Machine Room

Doors: A103A, F117A

3	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Lockset	9K3-7D15D L/C S3 TL/O	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP EDA	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N11 – Single Leaf; Custodial Closet (Smoke Seal from Corridor)

Doors: A116, A217, C113, F104, F205

3	Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N11.1 – Single Leaf; Custodial Closet (Smoke Seal from Corridor)

Doors: D105, E116

3	Hinge	BB1191 4 1/2 X 4 1/2	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA

SET #N12 – Single Leaf; Restroom

Doors: A101A, A102A, A118A, A119A, B104A, B113A, E117A, F101A, F102A, F118A, F119A

3	Hinge	BB1191 4 1/2 X 4 1/2	US32D	HA
1	Privacy Set	9K3-0L15D S3	626	BE
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Gasketing	5050 C-21 21'		NA
1	Finger Guard	2248 A 82" SMS-TEKS 8 X 3/4" TORX SECURITY SCREWS 8 x 3/4"		NA

SET #N13 – Single Leaf; Controlled Access; Restraint Room

Doors: E135 (Add/Alternate)

1	Continuous Hinge	780-224HD 83"	CLR	HA
2	Magnetic Lockset	GF3000		SC
1	Push Button	MPB100		LO
1	Power Supply	PS902-2RS-FA-KL		VO
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1	Push Plate	1001-3	630	TR
1	Closer	4040 XP EDA	AL	LC
1	Wall Bumper	1270CX	626	TR
1	Gasketing	5050 C-21 21'		NA

SET #N14 – Single Leaf; General Storage

Doors: B101B, C104, E122A, E123A, E113C, E121A

3	Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	BLACK	TR

SET #N14.1 – Single Leaf; General Storage

Doors: E103A, E122B

3	Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
3	Door Silencers	1229A	BLACK	TR

SET #N16 – 48"W Single Leaf; Electrical Room

Doors: C108

1	Continuous Hinge	780-224HD 83"	CLR	HA
1	Exit Device	LD 99EO	US26D, US32D	VO
1	Vandal Resistant Pull	VR910NL	US32D	IV
1	Core	Match FCPS Standard Cores	626	BE
1	Rim Cylinder	12E-72 L/C	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Floor Stop	1211	626	TR

1	Gasketing	5050 C-20 20'		NA
1	Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #N17 – Double Leaf; Egress; Cross Corridor

Doors: B100A, C100A

2	Continuous Hinge	780-224HD 83"	CLR	HA
2	Exit Device	RIM X Mullion	US26D	VO
2	Closer	4040 XP EDA 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
2	Overhead Door Stop	101S	US32D	GL
2	Magnetic Hold Open			
2	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Card Reader	9910NNNNEK2037P		
1	Power Supply	PS904 900-2RS-KL		
1	Power Transfer	EPT 10 CON		
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
2	Astragal	139 SP		NA
2	Gasketing	5050 C-21 21'		NA

SET #N17.1 – Double Leaf; Dual Egress; Cross Corridor

Doors: A200, F200

2	Continuous Hinge	112HD	628	IV
2	Exit Device	9949 EO F LBL	626	VO
2	Closer	4040 XP RW/PA	689	LC
2	Magnetic Hold Open	SEM7830	689	LC
2	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
2	Meeting Stile	8194AA 84" (2134MM)	BK	ZI
1	Gasketing	488SBK PSA	AA	ZI

SET #N20 – Single Leaf; Controlled Access; MDF (Smoke Seal from Corridor)

Doors: C121

3	Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Electric Strike	4212 S024	630	VO
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Coat Hook	3072	619	TR
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Gasketing	5050 C-21 21'		NA

SET #N20.1 – Single Leaf; Controlled Access: IDF

Doors: A204A, F218B

3	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Electric Strike	4212 S024	630	VO
1	Closer	4040 XP EDA	AL	LC
1	Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270WX	630	TR
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Coat Hook	3072	619	TR
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Gasketing	5050 C-21 21'		NA

SET #N21 –Single Leaf; Controlled Access; Reception from Vestibule

Doors: E102A

1	Continuous Hinge	780-224HD 87"	CLR	HA
1	Lockset	9K3-7D15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Electric Strike	6400 24VAC CON EB FSE S024	US32D	VO
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Wiring Diagram	Furnished by HWDE. Supplier		BY
1	Door Position Switch	9540	WHITE	RCIN
1	Card Reader	9910NNNNEK2037P		HID
1	Power Supply	PS904 900-2RS-KL		VO
1	Weatherstripping	By Alum. Door Mfg.		TECT

SET #N21.1 – Single Leaf; Main Corridor to Reception

Doors: E102B

1	Continuous Hinge	780-224HD 87"	CLR	HA
1	Lockset	9K3-7AB15D L/C S3	626	BE
1	Core	Match FCPS Standard Cores	626	BE
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61 STOP SPACER	AL	LC
1	Weatherstripping	By Alum. Door Mfg.		TECT

E. OPENING LIST:

Building Area: Exterior, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
000A	X1.2		FGFG	AL
000B	X1.1		FGFG	AL
001	X1		FGFG	AL
002A (Add/Alt)	X1		FGFG	AL
002B*	X1.5		N	F1B
003	X1.5		F	F1B
004	X1.7		FG	AL
005	X1		FGFG	AL
006	X1		FGFG	AL
007	X3		FF	F1B
008	X1.3		NN	F1B
009	X4		N	F1B
010	X3		FF	F1B
011	X1.3		NN	F1B
012	X3		FF	F1B
013	X1.4		F	F1B
014	X4		F	F1B
015			OH COILING	
016	X1.7		FG	AL
017	X1		FGFG	AL
018	X1.3		NN	F1B
019	X1.3		NN	F2
020	X1.6		N	F2
021	X1.8		FGFG	AL
022	X4		F	F1B
023	X1.6		N	F2
024	X1.3		NN	F2
025	X1.3		NN	F1B
026	X1		FGFG	AL
PG01	X7		EXT GATE	
PG02	X7		EXT GATE	
PG03	X7		EXT GATE	
PG04	X7		EXT GATE	
PG05	X7		EXT GATE	

* Omitted if Add/Alternate accepted.

Building Area: Exterior, Second Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
027	X6		F	F1A
028A	X6		F	F1B
028B	X6		F	F1B
029	X6		F	F2
030	X6		F	F1A
031	X6		F	F1A

Building Area: A, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
A100			F/S CURTAIN	
A101	N1		G	F1A
A101A	N12		F	F1A
A102	N1		G	F1A
A102A	N12		F	F1A
A103	7	S	F	F1A
A103A	N10.7	20	F	F1A
A104	N4		F	F1A
A106	N1		G	F1A
A108	N1		G	F1A
A109	N1		G	F1A
A110	N1		G	F1A
A111	N1		G	F1A
A112	N7	60	NN	F1B
A113	N1		G	F1A
A114	N1		G	F1A
A116	N11	S	L	F1A
A117			ELEVATOR	
A118	N1		G	F1A
A118A	N12		F	F1A
A119	N1		G	F1A
A119A	N12		F	F1A

Building Area: A, Second Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
A200	N17.1	90	GG	
A201	N1		G	F1A
A202	N1		G	F1A
A203	N1		G	F1A
A204	N10.2	S	F	F1A
A204A	N20.1		F	F1A
A204B	N4		F	F1A
A205	N1.1		G	S.K (OPP.)
A206	N1.1		G	F1A
A207	N1		G	F1A
A208	N7	60	NN	F1B
A209	N1		G	F1A
A210	N1		G	F1A
A211	N1		G	F1A
A212	N1		G	F1A
A213	N7.2	60	NN	F1B
A214	N1		G	F1A
A215	N1		G	F1A
A217	N11	S	L	F1A
A218			ELEVATOR	
A219	N1		G	F1A
A220	N1		G	F1A
A221	N1		G	F1A

Building Area: A, Penthouse

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
A301			ELEVATOR	

Building Area: B, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
B100A	N17	S	GG	F1A
B101	N6.3	S	GG	S.Y
B101A	N1.1		N	F1A
B101B	N14		F	F1A
B101C	N1.2		G	F1A
B101D	N1.1		N	F1A
B102	N10.2	S	F	F1A
B103	N10.2	S	F	F1A
B104	N1		G	F1A
B104A	N12		F	F1A
B105	N1		G	F1A
B106	N1.1		N	F1A
B107	N1.1		N	F1A
B108	N1.1		N	F1A
B109	N1	S	G	F1A
B110	N8		FGFG	S.Z (AL)
B111	N1.1		G	F1A
B112	N10.2	S	F	F1A
B113	N1		G	F1A
B113A	N12		F	F1A

Building Area: B, Second Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
B202	N1		G	F1A
B203	N1		G	F1A
B204	N1		G	F1A
B205	N1.1		N	F1A
B206	N1.1		N	F1A
B207	N1.1		N	F1A
B208	N1.1		N	F1A
B209	N1.1		N	F1A
B211	N1.1		N	F1A
B212	N1.1		N	F1A
B213	N1.1		N	F1A

Building Area: C, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
C100A	N17	S	GG	F1A
C100B	N6.4	S	G	S.W
C100C	N6		NN	F1B
C101	N7.1	90	NN	F1B
C101A	N7.1	90	GG	S.S (AL)

C101B	N7.1	90	GG	S.S (AL)
C101C	N1.5	90	F	F1B
C101D	N10.1	45	F	F1C
C101E	N1.4	90	FF	F1B
C101F	N10.5		FF	F1B
C102A	N6.2		GG	S.R
C102B	N6.2		GG	S.R
C102C	N6.2		GG	S.R
C102D	N6.2		GG	S.R
C102E	N1		N	F1A
C102F			OH COILING	
C103	N9		F	F1A
C103A	N4		F	F1A
C104	N14		L	F1A
C105	N1.1		N	F1A
C106	N10.4	90	F	F1B
C106A	N1.1		N	F1A
C107	N10.6	S	F	F1B
C108	N16	S	F	F1B
C109	N10.1		F	F1B
C110	N1.1	S	N	F1B
C110A	N4		F	F1B
C110B	N4		F	F1B
C111	N6.1		G	F1B
C111A	N10.3		F	F1B
C112	N6.1		G	F1B
C112B	N10.3		F	F1B
C113	N11	S	L	F1A
C121	N20	S	F	F1A

Building Area: C, Second Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
C201	N10	45	F	F1B

Building Area: D, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
D100A	N6		NN	F1A
D101A	N2.1	90	FF	F1B
D101B	N6.5	S	NN	F1B
D101C	N6.6	S	NN	F1B
D102A	N3		F	F1A
D102B	N3		F	F1A
D103	N2		FF	F1B
D104	N1.1		N	F1B
D104A	N4		F	F1B
D105	N11.1		F	F1B

Building Area: E, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
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E100B	N7	20	GG	F1A
E100C (Add/Alt)	N8.2	S	N	F1B
E101A	N8.1		FGFG	S.ZZ (AL)
E101B	N8		FGFG	S.ZZ (AL)
E102A	N21	S	G	S.P (AL)
E102B	N21.1		FG	S.Q
E102C	N1.3		N	F1B
E103	N1.6	S	N	F1B
E103A	N14.1		N	F1A
E103B	N1.1		N	F4
E103C	N4		N	F1B
E104	N1.1		N	F1A
E105	N1.1		N	F1A
E106	N1.1		N	F1A
E107	N1.1		N	F1A
E108	N1.1		N	F1A
E109	N1.1		N	F1A
E110	N1		N	F1A
E111	N4		F	F1A
E112A	N8.3		FGFG	S.O
E112B	N1.7	S	N	F1B
E113	N1.1	S	N	F1A
E113A	N1.1		N	F1A
E113B	N1.1		N	F1A
E113C	N14		F	F1A
E114	N4		F	F1A
E115	N4		F	F1A
E116	N11.1	S	L	F1A
E117	N1		G	F1A
E117A	N12		F	F1A
E118	N1.1	S	G	S.N
E120	N1		N	F1A
E121	N1.1	S	N	F1A
E121A	N14		F	F1A
E122	N1		G	S.L (OPP.)
E122A	N14		F	F1A
E122B	N14.1		N	F1A
E123	N1		G	S.L
E123A	N14		F	F1A
E124A	N6.7	S	NN	F1A
E124B	N6.4	S	N	F1A
E126	N4		F	F1A
E127	N1	S	N	F1A
E131 (Add/Alt)	N1	S	G	F1A
E132 (Add/Alt)	N1	S	G	F1A
E133 (Add/Alt)	N4	S	F	F1B
E134 (Add/Alt)	N1.1	S	N	F1A
E135 (Add/Alt)	N13	S	F	F1A
E136 (Add/Alt)	N1.1	S	N	F1A

Building Area: F, First Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
F100			F/S CURTAIN	
F101	N1		G	F1A
F101A	N12		F	F1A
F102	N1		G	F1A
F102A	N12		F	F1A
F103			ELEVATOR	
F104	N11	S	L	F1A
F106	N1		G	F1A
F107	N1		G	F1A
F108	N7	60	NN	F1B
F109	N1		G	F1A
F110	N1		G	F1A
F111	N1		G	F1A
F112	N1		G	F1A
F114	N1		G	F1A
F116	N4		F	F1A
F117	N10.2	S	F	F1A
F117A	N10.7	20	F	F1A
F118	N1		G	F1A
F118A	N12		F	F1A
F119	N1		G	F1A
F119A	N12		F	F1A

Building Area: F, Second Floor

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
F200	N17.1	90	GG	
F201	N1		G	F1A
F202	N1		G	F1A
F203	N1		G	F1A
F204			ELEVATOR	
F205	N11	S	L	F1A
F207	N1		G	F1A
F208	N1		G	F1A
F209	N7.2	60	NN	F1B
F210	N1		G	F1A
F211	N1		G	F1A
F212	N1		G	F1A
F213	N1		G	F1A
F214	N7	60	NN	F1B
F215	N1		G	F1A
F216	N1.1		G	F1A
F217	N1.1		G	S.K
F218	N10.2	S	F	F1A
F218A	N4		F	F1A
F218B	N20.1		F	F1A
F219	N1		G	F1A
F220	N1		G	F1A
F221	N1		G	F1A

Building Area: F, Penthouse

OPENING #	HW SET	OPENING LABEL	DOOR TYPE	FRAME TYPE
F301			ELEVATOR	

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- K. GANA (GM) - GANA Glazing Manual.
- L. GANA (SM) - GANA Sealant Manual.
- M. GANA (LGRM) - Laminated Glazing Reference Manual.
- N. ICC (IBC) - International Building Code.
- O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- P. ITS (DIR) - Directory of Listed Products.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- R. UL (DIR) - Online Certifications Directory.

- S. UL 10B - Standard for Fire Tests of Door Assemblies.
- T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- U. UL 263 - Standard for Fire Tests of Building Construction and Materials.
- V. UL 972 - Standard for Burglary Resisting Glazing Material.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.4 SUBMITTALS

- A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. **LEED Submittals: LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For glazing: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For storefront framing: Material Ingredient Report.**
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.6 MOCK-UPS

- A. Provide on-site glazing mock-up with the specified glazing components.

- B. Locate as indicated on drawings.

1.7 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

- A. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- B. Laminated Glass: Provide a ten (10) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 2. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with applicable codes.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 - 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
 - a. Refer to Section 07 2500.
 - 2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
 - 3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless noted otherwise.
 - 1. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.

- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 test requirements for Category II.
- C. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Material Ingredient Report**

2.4 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Warm-Edge Spacers: Low conductivity thermoplastic and stainless steel.
 - 4. Spacer Color: Black.
 - 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - 6. Color: Black.
 - 7. Purge interpane space with dry air, hermetically sealed.
- B. Type GL-1 - Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (solar control type), on #2 surface.
 - 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - 5. Total Thickness: 1 inch.
 - 6. Thermal Transmittance (U-Value): 0.29, maximum.
 - 7. Solar Heat Gain Coefficient (SHGC): 0.39, maximum.
 - 8. Glazing Method: Dry glazing method, gasket glazing.
- C. Type GL-2 - Insulating Glass Units: Spandrel glazing.
 - 1. Applications: Exterior spandrel glazing unless otherwise indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 - 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit, on #4 surface.
 - c. Opacifier Color: Grey.
 - 5. Total Thickness: 1 inch.
 - 6. Thermal Transmittance (U-Value): 0.29, maximum.
 - 7. Glazing Method: Dry glazing method, gasket glazing.

- D. Type GL-3 - Insulating Glass Units: Security Glazing.
1. Applications: Locations as indicated on drawings.
 2. Space between lites filled with air.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (solar control type), on #2 surface.
 - c. Interlayer: Clear Film, thickness as required to meet performance criteria.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 5. Performance Criteria:
 - a. Burglary Resistance: Pass UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.
 6. Total Thickness: 1 inch.
 7. Thermal Transmittance (U-Value): 0.29, maximum.
 8. Solar Heat Gain Coefficient (SHGC): 0.39, maximum.
 9. Glazing Method: Dry glazing method, gasket glazing.

2.5 GLAZING UNITS

- A. Type GL-11 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
 5. Glazing Method: Dry glazing method, gasket glazing.
- B. Type GL-12 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
1. See Section 08 4013 for glazing in fire-rated framing assemblies.
 2. Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
 - c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
 3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 4. Safety Glazing Certification: 16 CFR 1201 Category II.
 5. Glazing Method: As required for fire rating.
 6. Fire-Rating Period: As indicated on drawings.
 7. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
 - a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
 - b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
 - e. "XXX" - placeholder that represents fire-rating period, in minutes.
 8. Manufacturers:
 - a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.

- b. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.
 - c. Vetrotech North America; Contraflam: www.vetrotechusa.com/#sle.
- C. Type GL-13 - Transparent One-Way Mirror: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
- 1. Applications: Locations as indicated on drawings.
 - 2. Thickness: 1/4 inch.
 - 3. Glass Tint: Grey.
 - 4. Glass Type: Fully tempered.
 - 5. Glazing Method: Gasket glazing.

2.6 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- D. Glazing Clips: Manufacturer's standard type.

2.7 SOURCE QUALITY CONTROL

- A. Provide shop inspection and testing for fire-rated and laminated security glass.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - PRESSURE GLAZED SYSTEMS

- A. Application - Exterior Glazed: Set glazing infills from exterior side of building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install pressure plates without displacing glazing gasket; exert pressure for full continuous contact.
- E. Install cover plate.

3.6 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.7 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- C. Remove non-permanent labels immediately after glazing installation is complete.
- D. Clean glass and adjacent surfaces after sealants are fully cured.
- E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.8 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 9100 - LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.2 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- C. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
- D. AMCA 511 - Certified Ratings Program for Air Control Devices.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

1.3 SUBMITTALS

- A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For louvers: Material Ingredient Report.**
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.
- D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior surfaces.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.5 WARRANTY

- A. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
 - 1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Louvers:
 - 1. Airolite Company, LLC: www.airolite.com/#sle.
 - 2. American Warming and Ventilating: www.awv.com/#sle.
 - 3. Construction Specialties, Inc: www.c-sgroup.com/#sle.

2.2 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
 - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
 - 2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
 - 3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 4. Screens: Provide bird screens at all louvers.
 - 5. Hinged Units: Provide secondary frame to which louver frame is attached; non-ferrous hinges; provide at locations indicated on Drawings.
- B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
 - 1. Free Area: 50 percent, minimum.
 - 2. Blades: Drainable.
 - 3. Frame: Depth as indicated on drawings, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
 - 4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
 - 5. Aluminum Finish: Polyvinylidene fluoride coating; finish welded units after fabrication.
 - 6. Color: Custom, to match approved sample.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).

- B. Bird Screen: Interwoven wire mesh of aluminum, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.
- C. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.
- D. Primer: Zinc chromate, alkyd type.
- E. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**

2.4 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
 - 1. Manufacturers:
 - a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - c. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
 - 2. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected by Architect from manufacturer's custom line.

2.5 ACCESSORIES

- A. Blank-Off Panels: Aluminum face and back sheets, mineral fiber core, 1-1/2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Fasteners and Anchors: Galvanized steel.
- D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

3.2 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.

- B. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Install perimeter sealant and backing rod in accordance with Section 07 9200.
- G. Coordinate with installation of mechanical ductwork.

3.3 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Acoustic (sound-dampening) wall and ceiling board.

1.2 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- G. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.
- H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- K. ASTM E413 - Classification for Rating Sound Insulation.
- L. GA-216 - Application and Finishing of Gypsum Panel Products.
- M. GA-600 - Fire Resistance Design Manual.
- N. UL (FRD) - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For gypsum board: Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For gypsum board with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For regionally sourced gypsum board: Documentation indicating locations of recovery, manufacture and purchase of recycled raw materials.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For gypsum board, sound attenuation and joint compound: Material Ingredient Report.**
 - 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For gypsum board and sound attenuation within the building envelope: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

1.4 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Sound-Rated: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90/ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies as indicated on Drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 4. USG Corporation: www.usg.com/#sle.

B. Sustainable Design Requirements:

1. **Provide Material Ingredient Report.**
2. **For gypsum board and insulation installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
3. **Provide Industry-wide EPD or product-specific EPD. Include EPD Summary.**
4. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
5. **Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.**

C. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces, unless otherwise indicated.
2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
5. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
6. Thickness: 5/8 inch unless otherwise indicated on Drawings.

D. Abuse Resistant Wallboard:

1. Application: Located throughout project unless otherwise indicated on Drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Fire resistance rated Type X, UL or WH listed.
4. Thickness: 5/8 inch.
5. Edges: Tapered.

E. Impact Resistant Wallboard:

1. Application: High-traffic areas indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Fire resistance rated Type X, UL or WH listed.
4. Thickness: 5/8 inch.
5. Edges: Tapered.

F. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.

1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Type: Type X, in locations indicated.
5. Edges: Tapered.

G. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings, unless otherwise indicated.
2. Type: Type C at fire-rated assemblies.

3. Thickness: 1/2 inch.
 4. Edges: Tapered.
- H. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper faced, high density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating as indicated or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
1. Thickness: 5/8 inch unless otherwise indicated.
 2. Long Edges: Tapered.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- I. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 2. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2.3 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness as indicated.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide L-bead at exposed panel edges unless noted otherwise.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
 2. Architectural Reveal Beads:
 - a. Shapes: As shown on Drawings.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 3. Ready-mixed vinyl-based joint compound.
 4. Powder-type vinyl-based joint compound.
 5. Chemical hardening type compound.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.2 SHAFT WALL INSTALLATION

- A. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

3.4 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- F. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Decorative Trim: Install at locations shown on drawings and in accordance with manufacturer's instructions.

3.6 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 3: Walls to receive textured wall finish.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Taping, filling and sanding is not required at base layer of double layer applications.

3.7 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.2 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- G. ASTM E413 - Classification for Rating Sound Insulation.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For steel framing: provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**

- a. **For steel framing and suspension systems with recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For regionally sourced steel framing: Documentation indicating locations of recovery, manufacture and purchase of recycled raw materials.**
- 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For steel framing and suspension systems: Material Ingredient Report.**

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 DESCRIPTION

- A. **Fire-Test-Response Characteristics:** For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. **STC-Rated Assemblies:** For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING MATERIALS

- A. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - 3. **Documentation indicating locations of recovery, manufacture and purchase of recycled raw materials.**
 - 4. **Material Ingredient Report**
- B. **Fire Rated Assemblies:** Comply with applicable code and as indicated on drawings.
- C. **Non-Loadbearing Framing System Components:** ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. **Studs:** C shaped with flat or formed webs with knurled faces.
 - 2. **Runners:** U shaped, sized to match studs.
 - 3. **Ceiling Channels:** C shaped.
 - 4. **Furring:** Hat-shaped sections, minimum depth of 7/8 inch.
- D. **Loadbearing Studs:** As specified in Section 05 4000.
- E. **Ceiling Hangers:** Type and size as specified in ASTM C754 for spacing required.
- F. **Partition Head to Structure Connections:** Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
- G. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- H. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- I. Fasteners: ASTM C1002 self-piercing tapping screws.
- J. Sheet Metal Backing: 0.036 inch thick, galvanized.
- K. Anchorage Devices: Powder actuated.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.
- 2.3 FABRICATION
- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure in all locations, unless shown otherwise on drawings.
- C. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Align and secure top and bottom runners at 24 inches on center.
- E. At partitions indicated with an acoustic rating:
1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.

- F. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
 - 1. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Install studs vertically at 12, 16 or 24 inches on center, to meet specified performance requirements.
- I. Align stud web openings horizontally.
- J. Secure studs to tracks.
- K. Stud splicing is not permissible.
- L. Fabricate corners using a minimum of three studs.
- M. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- N. Brace stud framing system rigid.
- O. Coordinate erection of studs with requirements of all openings; install supports and attachments.
- P. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- Q. Blocking: Use wood blocking secured to studs. Provide blocking where indicated, and for support of toilet partitions, wall cabinets, toilet accessories, and other wall mounted accessories.
- R. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.3 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

3.4 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for wall applications.
- B. Non-ceramic trim.

1.2 REFERENCE STANDARDS

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
- C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.
- D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
- E. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- J. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.
- K. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- L. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
- M. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
- N. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.

- O. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation.
- P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- Q. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than 15 of each type.
- F. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For tile and grout: Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For grout, cement board, underlayment and waterproofing membrane: Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For cement board, underlayment and waterproofing membrane within the building envelope: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.5 MOCK-UP

- A. Construct tile mock-up in a location where all components specified for the project can be incorporated.
 - 1. Approved mock-up may remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

- A. Manufacturers: All products of each type by the same manufacturer.
 - 1. American Olean Corporation: www.americanolean.com/#sle.
 - 2. Dal-Tile Corporation: www.daltile.com/#sle.
 - 3. Lugarno Ceramics: www.lugarnoceramics.com/.
- B. **Sustainable Design Requirements:**
 - 1. **Provide product-specific declaration or industry-wide EPD or product-specific EPD. Include EPD Summary.**
- C. Glazed Wall Tile, Type W2: ANSI A137.1, standard grade.
 - 1. Size: 2 x 8 inch, nominal.
 - 2. Surface Finish: High gloss.
 - 3. Color(s): As indicated on drawings.
 - 4. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.
- D. Glazed Wall Tile, Type B2: ANSI A137.1, standard grade.
 - 1. Size: 4 x 16 inch, nominal.
 - 2. Surface Finish: High gloss.
 - 3. Color(s): As indicated on drawings.
 - 4. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.
- E. Glazed Wall Tile, Type W7: ANSI A137.1, standard grade.
 - 1. Size: 6 x 12 inch, nominal.
 - 2. Surface Finish: High gloss.
 - 3. Color(s): As indicated on drawings.
 - 4. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.
- F. Glazed Wall Tile, Type W3.1, W3.2 & W3.3: ANSI A137.1, standard grade.
 - 1. Size: 12 x 24 inch, nominal.
 - 2. Surface Finish: Matte glaze.
 - 3. Color(s): As indicated on drawings.
 - 4. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.

2.2 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall tile.
 - b. Wall corners, outside and inside.

- c. Floor to wall joints.
- d. Borders and other trim as indicated on drawings.
- 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.
 - b. Genesis APS International: www.genesis-aps.com/#sle.

2.3 SETTING MATERIALS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - 2. Bostik Inc: www.bostik-us.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 - 1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
- C. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.4 GROUTS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 - 2. Bostik Inc: www.bostik-us.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 - 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 - 3. Color(s): As selected by Architect from manufacturer's full line.
 - 4. Products:
- C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 - 1. Applications: High-traffic areas, corridors.
 - 2. Color(s): As selected by Architect from manufacturer's full line.
- D. **Sustainable Design Requirements:**
 - 1. **Provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **Provide Material Ingredient Report.**

2.5 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
- B. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**
 - 2. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles for receipt of non-ceramic trim.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - WALL TILE

- A. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.
- B. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.5 CLEANING

- A. Clean tile and grout surfaces.

3.6 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2016.
- C. ASTM E1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers; 2017.
- D. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- E. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- G. UL (GGG) - GREENGUARD Gold Certified Products.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For acoustical ceiling panels and steel suspension system: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**

- a. **For recycled content acoustical ceiling panels and steel suspension system: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For acoustical ceiling panels, suspension system and touch-up paint: Material Ingredient Report.**
- 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For acoustical ceiling panels: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
 - b. **For touch-up paint: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**
- D. **Samples:** Submit two samples 6x6 inch in size illustrating material and finish of acoustical units.
- E. **Maintenance Materials:** Furnish the following for Owner's use in maintenance of project.
 - 1. **Extra Acoustical Units:** Quantity equal to 2 percent of total installed.

1.5 FIELD CONDITIONS

- A. Maintain uniform temperature within range recommended by manufacturer, but not less 60 degrees F, with a maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.6 MOCK-UP

- A. Construct mock-up to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mock-up of each ceiling type installation where directed.
 - 2. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. **Acoustic Tiles/Panels:**
 - 1. **Armstrong World Industries, Inc:** www.armstrong.com/#sle.
 - 2. **CertainTeed Corporation:** www.certainteed.com/#sle.
 - 3. **USG:** www.usg.com/#sle.

- B. **Suspension Systems:**
 - 1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

- A. **Acoustical Units - General:** ASTM E1264, Class A.
- B. **Acoustical Panels - Ceiling:** Painted mineral fiber, ASTM E1264 Type III, Form 2, Pattern CE, with the following characteristics:
 - 1. **Size:** 24 by 24 inches and 24 by 48 inches, as indicated on drawings.

2. Thickness: 3/4 inches.
 3. Composition: mineral fiber.
 4. NRC: 0.70 min as determined by ASTM C423.
 5. CAC: 35 min as determined by ASTM E1414.
 6. Edge: Square.
 7. Surface Color: White.
 8. Suspension System: Exposed Steel Suspension System Type A.
 9. Products:
 - a. 1713/1714 - School Zone Fine Fissured by Armstrong.
 - b. 22421/22441 - Radar High-NRC/High-CAC by USG.
 - c. HHF-457 HNRC/HHF-497 HNRC Fine Fissured High NRC by CertainTeed.
 10. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**
 - d. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification**
- C. Acoustical Panels - Kitchen Ceiling: Painted mineral fiber, ASTM E1264 Type IX, Form 2, Pattern G, with the following characteristics:
1. Size: 24 x 48 inches.
 2. Thickness: 5/8 inches.
 3. Composition: Mineral fiber.
 4. CAC: 33 min as determined by ASTM E1414.
 5. Light Reflectance: 0.89 min as determined by ASTM E1477.
 6. Edge: Square.
 7. Surface Color: White.
 8. Surface Texture: Medium.
 9. Paint: Factory-applied vinyl latex paint.
 10. Suspension System: Exposed Steel Suspension System Type B.
 11. Products:
 - a. 672 - Kitchen Zone by Armstrong.
 - b. 3410 - Kitchen Lay-in Tile by USG.
 - c. 1100-CRF-1 - VINYLSHIELD A by CertainTeed.
 12. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**
 - d. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification**
- D. Acoustic Panels - Shower Ceiling: Painted mineral fiber, ASTM E1264 Type XX, Pattern C E, with the following characteristics:
1. Size: 24 x 48 inches.
 2. Thickness: 5/8 inches.
 3. Composition: Ceramic and mineral fiber composite.
 4. NRC: 0.55 min as determined by ASTM C423.

5. CAC: 40 min as determined by ASTM E1414.
6. Light Reflectance: 0.82 min as determined by ASTM E1477.
7. Edge: Square.
8. Surface Color: White.
9. Paint: Scrubbable factory-applied plastic paint.
10. Suspension System: Exposed Steel Suspension System Type C.
11. Products:
 - a. 607 - CERAMAGUARD Fine Fissured by Armstrong.
 - b. 56645 - Radar Ceramic Acoustical Panels by USG.
 - c. Comparable by CertainTeed.
12. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**
 - d. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification**

2.3 SUSPENSION SYSTEM(S)

- A. Manufacturer: Same as for acoustical units.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System Type A: Formed steel, commercial quality cold rolled; heavy-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: White painted.
 4. Products:
 - a. Prelude XL 15/16" by Armstrong.
 - b. Comparable product by USG.
 - c. Comparable product by CertainTeed.
 5. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**
- D. Exposed Steel Suspension System Type B: Formed steel, commercial quality, hot dipped galvanized steel; heavy-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Steel: Hot dipped galvanized.
 4. Finish: White painted.
 5. Products:
 - a. Prelude Plus XL Fire Guard 15/16" by Armstrong.
 - b. Comparable product by CertainTeed.

- c. Comparable product by USG.
 - 6. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**
- E. Exposed Aluminum Suspension System Type C: Aluminum.
- 1. Profile: Tee; 15/16 inch wide face.
 - 2. Finish: Painted white.
 - 3. Products:
 - a. Prelude Plus XL Aluminum 15/16" by Armstrong.
 - b. Comparable product by USG.
 - c. Comparable product by CertainTeed.
 - 4. **Sustainable Design Requirements:**
 - a. **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - b. **Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
 - c. **Provide Material Ingredient Report.**

2.4 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
 - 2. At every outside corner bullnose in a CMU wall, provide a bullnose corner cover.
- C. Touch-up Paint: Type and color to match acoustical and grid units.
 - 1. **Sustainable Design Requirements:**
 - a. **For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**
 - b. **Provide Material Ingredient Report.**

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.

- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected ceiling plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- G. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.4 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For flooring provide industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For flooring provide Material Ingredient Report. Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
- C. Shop Drawings: Provide plans indicating product, color and texture, floor pattern(s), and direction(s) of material. For sheet flooring, plans should indicate seam locations.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Verification Samples: Submit two full-size samples, or two samples a minimum of 12 by 12 inches, illustrating color, texture and pattern for each resilient flooring product specified.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area within range recommended by manufacturer(s) but at a temperature no less than 55 degrees F and no more than 90 degrees F.

D. Do not double stack pallets.

1.6 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.

1. Manufacturers:

a. Armstrong World Industries, Inc; Standard Excelon Imperial Texture Diamond 10: www.armstrong.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.

3. Size: 12 by 12 inch.

4. Thickness: 0.125 inch.

5. Pattern: As indicated on Drawings. Laser cut complex angles.

6. Color: As indicated on drawings.

7. **Sustainable Design Requirements:**

a. **Provide industry-wide or product-specific EPD. Include EPD Summary.**

b. **Provide Material Ingredient Report.**

c. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

B. Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer.

1. Manufacturers:

a. Mannington Mills, Inc.: www.mannington.com/.

b. Novalis Innovative Flooring (AVA): <https://avaflor.com/>.

c. Mohawk Carpet, LLC: www.mohawkgroup.com/.

2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
3. Square Tile Size: 12 by 12 inch.
4. Wear Layer Thickness: 0.040 inch.
5. Total Thickness: 0.125 inch.
6. Color: As indicated on drawings.
7. **Sustainable Design Requirements:**
 - a. **Provide industry-wide or product-specific EPD. Include EPD Summary.**
 - b. **Provide Material Ingredient Report.**
 - c. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

2.2 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
 1. Height: 4 inch.
 2. Thickness: 0.125 inch.
 3. Finish: Satin.
 4. Length: Roll.
 5. Color: To be selected by Architect from manufacturer's full range.
 6. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

- A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
 1. VOC Content Limits: As specified in Section 01 6116.
- B. Moldings, Transition and Edge Strips: Rubber.
 1. Manufacturers:
 - a. Mannington Commercial: www.manningtoncommercial.com/.
 - b. Roppe Corp: www.roppe.com/.
 - c. Johnsonite, a Tarkett Company: commercial.tarkett.com/.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 1. Test in accordance with ASTM F710.
 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

- D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints and butt seams tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
 - 2. Resilient Strips: Attach to substrate using adhesive.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- I. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.4 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

3.5 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6566 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rubber sheet flooring, adhesively installed.
- B. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For flooring provide Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For flooring provide documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
- D. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.
- E. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.
- F. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
 - 1. Include samples of game lines, illustrating colors selected.
- G. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.6 FIELD CONDITIONS

- A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.1 PREFORMED ATHLETIC FLOORING

- A. Rubber Sheet Flooring: Recycled rubber tires with urethane binder, lengths to avoid transverse seams.
 - 1. Thickness: Minimum 8mm / 0.314961 inch.
 - 2. Sheet Width: Minimum 72 inches.
 - 3. Tensile Strength: Minimum 150 psi, per ASTM D412.
 - 4. Color: As indicated on Drawings.
 - 5. Manufacturers:
 - a. Mondo Sport & Flooring; Advance New Generation: www.mondoworldwide.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 6. **Sustainable Design Requirements:**
 - a. **Provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - b. **Provide Material Ingredient Report.**
 - c. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

2.2 ACCESSORIES

- A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.
- C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.
- D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Comply with manufacturer's recommendations.
- C. Resilient Sheet Flooring:
 - 1. Unroll flooring and allow to relax before beginning installation.
 - 2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
 - 3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
 - 4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
 - 5. Weld seams using techniques and equipment recommended by manufacturer.
 - 6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
 - 7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.4 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.5 PROTECTION

- A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Divider strips.
- C. Precast epoxy terrazzo stair units.
- D. Recessed mat frames within terrazzo field.

1.2 REFERENCE STANDARDS

- A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
- B. NTMA (GRAD) - Aggregate Gradation Standards.
- C. NTMA (EPOXY) - Epoxy Terrazzo Specifications.

1.3 SUBMITTALS

- A. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For flooring provide Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.
- D. Samples: Submit two samples, 6 inch by 6 inch in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.
- E. Installer's Qualification Statement.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Precast Treads: 2 units.
- G. LEED Submittal: Documentation of recycled content and location of manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. Minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by matrix manufacturer.

1.5 MOCK-UP

- A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 3 by 3 feet.
- B. Locate where directed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store terrazzo materials in a dry, secure area.
- B. Maintain minimum temperature of 60 degrees F.
- C. Keep products away from fire or open flame.

1.7 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Resinous Matrix Terrazzo Flooring:
 - 1. Key Resin Company; Key Epoxy Terrazzo System: www.keyresin.com/#sle.
 - 2. Sherwin-Williams Company; General Polymers Brand; Terrazzo #1100: www.generalpolymers.com/#sle.
 - 3. Terrazzco; TERRAZZCO Epoxy Terrazzo System, a brand of Concord Terrazzo Company, Inc: www.terrazzco.com/#sle.
- B. Precast Resinous Matrix Terrazzo Units:
 - 1. Tectura Designs, a division of Wausau Tile Inc; Precast Epoxy Tread Risers #E31: www.tecturadesigns.com/#sle.
 - 2. Terrazzco; Stair Treads and Risers: <http://terrazzco.com/terrazzo-stair-treads-risers/>.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors:
 - 1. Thickness: 3/8 inch, nominal.
 - 2. Color(s): To be selected by Architect.
 - 3. Aggregate Type: Marble chips.
 - 4. Aggregate Size: No. 2.
- B. Stairs - Treads, Risers, and Landings:
 - 1. Thickness: 1/2 inch, minimum.
 - 2. Color(s): Same as adjacent floor.
 - 3. Aggregate Type and Size: Same as floors.

2.3 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
- D. Finishing Grout: Epoxy, color to match terrazzo matrix.
- E. Precast Epoxy Terrazzo Units: Fabricate to sizes and profiles indicated on drawings.
 - 1. Setting Material: Latex Portland cement mortar, ANSI A118.4.
- F. **Sustainable Design Requirements:**
 - 1. **Provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **Provide Material Ingredient Report.**
 - 3. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

2.4 ACCESSORIES

- A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Anchors and Reinforcement for Precast Units: As recommended by manufacturer for type of installation.
- E. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.

- F. Primer: As recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture vapor emission, internal relative humidity, and alkalinity; obtain instructions if test results are not within limits recommended by terrazzo materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions.
- C. Apply primer in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Saw cut substrate to install divider and control joint strips.
- B. Install control joint strips straight and flat to locations indicated.
- C. Install divider strips according to pattern approved on shop drawings.
- D. Install non-slip inserts in stair treads where indicated.
- E. Install recessed floor mat frames.
- F. Place terrazzo mix over substrate to thickness indicated.
- G. Anchor precast units as indicated on drawings.
- H. Install precast units using specified setting material.

3.4 FINISHING

- A. Finish terrazzo to NTMA requirements.

- B. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.
- C. Apply grout to fill voids exposed from grinding.
- D. Remove grout coat by grinding, using a fine grit abrasive.

3.5 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.6 CLEANING

- A. Immediately after terrazzo has dried, apply 2 coats, minimum, of sealer in accordance with manufacturer's instructions.
- B. Polish surfaces in accordance with manufacturer's instructions.

3.7 PROTECTION

- A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.
- B. Apply 3 coats of sealer at Date of Substantial Completion.

END OF SECTION

SECTION 09 6700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied flooring and base.

1.2 REFERENCE STANDARDS

- A. ANSI/ESD STM7.1 - Standard Test Method for the Protection of Electrostatic Discharge Susceptible Items - Floor Materials - Resistive Characterization of Materials.
- B. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For flooring provide Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
- C. Samples: Submit two samples, 8x8 inch in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Top Coat Materials: 2 gallons.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Approved by manufacturer.

1.5 MOCK UP

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.

1. Number of Mock-Ups to be Prepared: One.
2. Use same materials and methods for use in the work.
3. Locate where directed.
4. Minimum Size: 48 inches by 48 inches.

B. Obtain approval of mock-up by Architect before proceeding with work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring: Epoxy base coat(s), with broadcast aggregate.
 1. Aggregate: Quartz granules.
 2. Top Coat: Polyurethane.
 3. System Thickness: 1/8 inch, nominal, when dry.
 4. Texture: Smooth.
 5. Sheen: High gloss.
 6. Color: As selected by Architect.
 7. Products:
 - a. PPG Paints Megaseal Fluid Applied Flooring: www.ppgpaints.com/#sle and www.ppgpmc.com/home.aspx/#sle.
 - b. Sherwin-Williams Company: General Polymers Brand: www.generalpolymers.com/#sle.
 - c. Sika Corporation: www.sikafloorusa.com/#sle.
 8. **Sustainable Design Requirements:**
 - a. **Provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - b. **Provide Material Ingredient Report.**
 - c. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certifications.**

2.2 ACCESSORIES

- A. Fillet Strips: Molded of flooring resin material.
- B. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- C. Primer: Type recommended by fluid-applied flooring manufacturer.

- D. Thresholds: Gray; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
 - 1. Material: Quartz-based stone.
 - 2. Finish: Honed.
 - 3. Edges: Double beveled, as indicated.
 - 4. Applications:
 - a. At doorways where fluid-applied flooring terminates.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Prepare concrete surfaces according to ICRI 310.2R.
- C. Vacuum clean substrate.
- D. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

- A. Install fillet strips at base of walls where flooring is to be extended up wall as base.
- B. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness indicated.
- C. Finish to smooth level surface.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Test installed floor surface in accordance with ANSI/ESD STM7.1 .

3.6 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

SECTION 09 6816 - SHEET CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Carpet, direct-glued.

1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 7419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet scrap.

1.3 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. CRI 104 - Standard for Installation of Commercial Carpet.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For flooring provide Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**
- D. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
- E. Samples: Submit two samples 12 x 24 inch in size illustrating color and pattern for each carpet material specified.
- F. Submit two, 4 inch long samples of edge strip for each color specified.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional requirements.
 - 2. Extra Carpet: 100 sq ft of each type, color, and pattern installed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet with minimum three years documented experience and approved by carpet manufacturer.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.6 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Carpet:
 - 1. J & J Industries, Inc; Kinetex: www.jjindustries.com/#sle.
 - 2. Mannington Commercial; Integra HP: www.manningtoncommercial.com/.
 - 3. Tarkett Commercial; Powerbond Hybrid Resilient: commercial.tarkett.com/.

2.2 CARPET

- A. Carpet: Tufted, nylon.
 - 1. VOC Content: Comply with Section 01 6116.
 - 2. Primary Backing:
 - a. Material: Polypropylene.
 - 3. **Sustainable Design Requirements:**
 - a. **Provide Industry-wide or product-specific EPD. Include EPD Summary.**
 - b. **Provide Material Ingredient Report.**
 - c. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.**

2.3 ACCESSORIES

- A. Moldings and Edge Strips: Rubber, color as selected.
- B. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Lay out carpet and locate seams in accordance with shop drawings.
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
- E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.4 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges.

3.5 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 7200 - WALL COVERINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall covering.

1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 9123 - Interior Painting: Preparation and priming of substrate surfaces.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. GA-214-2015 - Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-reinforced Gypsum Panels; 2015.

1.4 SUBMITTALS

- A. Product Data: Provide data on wall covering and adhesive.
- B. Shop Drawings: Indicate wall elevations with seaming layout.
- C. Samples: Submit two samples of wall covering, 8 x 8 inch in size illustrating color, finish, and texture.
- D. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
 - 3. Cleaning instructions that include precautions against materials and methods that may be detrimental to finishes and performance.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

1.8 WARRANTY

- A. Submit manufacturer's limited 5 year warranty against manufacturing defects.

PART 2 PRODUCTS

2.1 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
- B. Wall Covering: Fabric-backed vinyl roll stock.
 - 1. Total Thickness: 30 mil (0.03 inch).
 - 2. Roll Width: 48 inches.
 - 3. Backing: Non-woven, synthetic fabric.
 - 4. Color: White.
 - 5. Manufacturers:
 - a. Koroseal/RJF International; Walltalkers Mag-Rite: www.koroseal.com/#sle.
 - b. MDC Wallcoverings; DEW15303 - Magnet Receptive Dry Erase Wallcovering: www.mdcwall.com/#sle.
 - c. Ventress, Inc.; TSMG-WO Transcribe Dry Erase Wallcovering: www.transcribedryerasewalls.com/.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Termination Trim: Anodized Aluminum, clear.
 - 1. Low-profile, J-cap.
 - 2. Aluminum or Plastic Marker Dispenser, color as selected from manufacturer's standard range.
- E. Substrate Primer and Sealer: As recommended by adhesive and wall covering manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and conform to requirements of the wall covering manufacturer. Ensure surface conditions meet or exceed a Level 5 finish per GA-214-2015 Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-reinforced Gypsum Panels.

- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

3.2 PREPARATION

- A. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- C. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.
- D. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- E. Butt edges tightly.
- F. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- G. Do not install wall covering more than 1/4 inch below top of resilient base.
- H. Install termination trim.
- I. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.4 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.5 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 8430 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing panels.

1.2 REFERENCE STANDARDS

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

1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed data sheets for products specified.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.
- D. Verification Samples: Fabricated samples of each type of panel specified; 6 x 6 inch, showing construction, edge details, and finish color.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium. Maintain a uniform temperature of 55-70 degrees F and a relative humidity of 65-75% for a 24-hour period before, during and after installation.
- D. Protect edges from damage.

1.5 MOCK-UP

- A. Construct mock-up of acoustical units at location as indicated by Architect.
 - 1. Minimum mock-up dimensions; 96 by 96 inches.
 - 2. Approved mock-up may remain as part of the Work.

1.6 WARRANTY

- A. Submit a 5 year written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - 1. Defects in materials or factory workmanship.
- B. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 WOOD FIBER ACOUSTIC WALL PANELS

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc; TECTUM: www.armstrong.com/
 - 2. Acoustical Surfaces, Inc.; Envirocoustic Wood Wool: www.acousticalsurfaces.com/.
 - 3. Cardinal Acoustics; Specialty Panels: www.cardinalacoustics.com/.
- B. Wood Fiber Acoustic Panels for Walls:
 - 1. Surface Burning Characteristics: Class A
 - 2. Mounting: Mechanically fastened.
 - 3. Noise Reduction Coefficient (NRC): 0.40, minimum, when tested in accordance with ASTM C423.
 - 4. Panel Size: As indicated on drawings.
 - 5. Panel Thickness: 1 inch.
 - 6. Panel Color(s): As indicated on drawings.

2.2 THERMOFORMED PLASTIC SOUND-ABSORBING UNITS

- A. Manufacturers:
 - 1. Lamvin; Barrel Diffuser: www.lamvin.com/#sle.
 - 2. Wenger; Convex Type I Diffuser Panel: www.wengercorp.com/.
- B. Thermoformed Copolymer Plastic Acoustical Panels for Walls and Ceilings:
 - 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Mounting: Back-mounted with mechanical fasteners.
 - 3. Mounting: Lay-in panel for suspended ceiling system, exposed grid.

2.3 FABRICATION

- A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.4 ACCESSORIES

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal:
- B. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Do not install wall panels until building is closed in and HVAC system is operational.

3.2 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- C. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 - 1. Plumb and level.
 - 2. Flatness.
 - 3. Width of joints.

3.3 CLEANING

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 6. Floors, unless specifically indicated.
 - 7. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 8. Glass.
 - 9. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

- A. Section 09 9600 - High-Performance Coatings.

1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.

2. Allow 30 days for approval process, after receipt of complete samples by Architect.
 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, repair of painted and finished surfaces, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Benjamin Moore: www.benjaminmoore.com/.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

2.4 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Prime surfaces to receive wall coverings.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 9. Glass.
 - 10. Acoustical materials, unless specifically indicated.
 - 11. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

- A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- B. SSPC-SP 1 - Solvent Cleaning.
- C. SSPC-SP 2 - Hand Tool Cleaning.
- D. SSPC-SP 6 - Commercial Blast Cleaning.
- E. SSPC-SP 13 - Surface Preparation of Concrete.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 2. MPI product number (e.g. MPI #47).
 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For paints and coatings: Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For paints and coatings: Provide Material Ingredient Report.**
 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**
- D. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Allow 30 days for approval process, after receipt of complete samples by Architect.
- E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures.
- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, repair of painted and finished surfaces, and color samples of each color and finish used.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Benjamin Moore: www.benjaminmoore.com/.
- C. Transparent Finishes:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - 2. PPG Paints Deft Interior Clears/Polyurethanes: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. **Sustainable Design Requirements:**
 - 1. **Provide Material Ingredient Report.**
 - 2. **For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**

- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board and concrete masonry units.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex.
 - a. Products:
 - 1) PPG Paints Pure Performance Interior Latex, 9-300XI Series, Eggshell. (MPI #144)
 - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
 - 3) Benjamin Moore Natura Waterborne Interior Latex, Eggshell. (MPI #144).
 - 3. Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
 - b. Eggshell: MPI gloss level 3; use this sheen at all locations, unless indicated otherwise.
 - 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 - 1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
 - 2. Two top coats and one coat primer.
 - 3. Top Coat(s): Interior Alkyd, Water Based; MPI #167, 168, or 169.
 - a. Products:
 - 1) PPG Paints Speedhide Interior/Exterior WB Alkyd Satin, 6-1410 Series.
 - 2) Sherwin-Williams ProClassic Waterborne Interior Acrylic Enamel, Satin.
 - 3) Benjamin Moore ADVANCE Waterborne Alkyd, Satin.
 - 4. Primer: As recommended by top coat manufacturer for specific substrate.
- C. Dry Fall: Metals; exposed structure and overhead-mounted services at stage/platform, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 - 1. Shop primer by others.
 - 2. One top coat.
 - 3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
 - a. Products:
 - 1) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog, 6-725XI, Flat. (MPI #118)
 - 2) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118)
 - 3) Benjamin Moore Latex Dry Fall, Flat. (MPI #118).
 - 4. Primer: As recommended by top coat manufacturer for specific substrate.
- D. Transparent Finish on Concrete Floors.

1. 2 coats sealer.
2. Sealer: Water Based for Concrete Floors; MPI #99.
 - a. Products:
 - 1) Behr Premium Wet-Look Sealer Low-Lustre [No. 986]. (MPI #99)
 - 2) PPG Paints Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer Stain, 4-6200. (MPI #99)

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Masonry Units : 12 percent.
 3. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 1. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- F. Masonry:

1. Prepare surface as recommended by top coat manufacturer.
- G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces:
 1. Prepare surface according to SSPC-SP 2.
- J. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- K. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

- A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 6 - Commercial Blast Cleaning.
- F. SSPC-SP 7 - Brush-Off Blast Cleaning.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For paints and coatings provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For paints and coatings provide Material Ingredient Report.**
 - 3. **EQ Credit 2: Low-Emitting Materials**
 - a. **For wet-applied paints and coatings exposed to the interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**
- C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.
- C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- E. Restrict traffic from area where coating is being applied or is curing.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.
- B. Provide high performance coating products from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- C. High-Performance Coatings:
 1. PPG Paints: www.ppgpaints.com/#sle.
 2. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
 3. Tnemec Company, Inc: www.tnemec.com/#sle.

2.2 HIGH-PERFORMANCE COATINGS

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

2.3 TOP COAT MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
 1. Volatile Organic Compound (VOC) Content:
 - a. Provide coatings that comply with the most stringent requirements specified in the following:
 - 1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2) Architectural coatings VOC limits of the State in which the Project is located.
 - 3) USGBC LEED Rating System, edition as stated in Section 01 3515; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
 - b. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
 - B. High-Build Epoxy Coating for exterior, below-grade steel:
 1. Number of Coats: Two.
 2. Top Coat(s): Epoxy, High-Build; MPI #98.
 - a. Products:
 - 1) PPG Paints; Amerlock 400 Epoxy, Semi-Gloss, AK-400 Series; MPI #108: www.ppgpaints.com/#sle.
 - 2) Tnemec Company, Inc. Series N69 Hi-Build Epoxoline II: www.tnemec.com/.
 3. Primer: As recommended by coating manufacturer for specific substrate.
 - C. Urethane Coating for exterior, above-grade steel:
 1. Number of Coats: Two.
 2. Top Coat(s): Polyurethane, Two-Component; MPI #72.
 - a. Sheen: Semi-Gloss.
 - b. Products:
 - 1) PPG Paints Amershield VOC Polyester Acrylic Polyurethane, AMV-3 Series: www.ppgpaints.com/#sle.
 - 2) Tnemec Company, Inc. Series 1095 Endura-Shield: www.tnemec.com/#sle.
 3. Primer: As recommended by coating manufacturer for specific substrate.

- D. Acrylic Insulation Coating for steel that penetrates the thermal envelope:
1. Number of Coats: Two.
 2. Intermediate Coat(s): Acrylic Insulation Coating, One-Component.
 - a. Products:
 - 1) Tnemec Company, Inc. Series 971 Aerolon: www.tnemec.com/#sle.
 - 2) Carboline Company; Carbotherm 3300: www.carboline.com.
 3. Primer: As recommended by coating manufacturer for specific substrate.
 4. Temperature and Humidity Requirements: Maintain air temperature and relative humidity in areas where products will be applied for a time period before during and after application as recommended by manufacturer.
 - a. Do not apply coating when temperature of substrate and/or surrounding ambient air temperature is below 45° F. Temporary protection and heat shall be maintained at this minimum temperature for 24 hours before, during and 24 hours after material application.
 - b. Steel substrate temperature shall be a minimum of 5° F (3° C) above the dew point of the surrounding air for a period of 24 hours prior, during the application of the material and 24 hour cure period.
 - c. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.
 - d. The relative humidity of the application area shall not exceed a maximum of 85% 24 hours prior, during and 24 hours after the application of the material. The relative humidity shall not exceed 75% throughout the application and curing of the decorative top coat finish.
 5. **Sustainable Design Requirements:**
 - a. **Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.**
 - b. **Provide Material Ingredient Report.**
- E. Shellac: Pure, white type.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- F. Test shop-applied primer for compatibility with subsequent cover materials.
- G. Proceed with coating application only after unacceptable conditions have been corrected.
 - 1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- E. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.
- F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.3 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.4 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Manufacturer's Technical Services: Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.
- C. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, and specified thickness, Contractor shall pay for retesting and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations, and specified thickness.

3.6 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.
- D. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.7 PROTECTION

- A. Protect finished work from damage.

END OF SECTION

SECTION 10 1101 - VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Markerboards and Tackboards.

1.2 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's data on markerboard, tackboard, trim, and accessories.
- B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- C. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.
- D. Test Reports: Show conformance to specified surface burning characteristics requirements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 WARRANTY

- A. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Visual Display Boards:
 - 1. Claridge Products and Equipment, Inc. - www.claridgeproducts.com
 - 2. Polyvision Corporation (Nelson Adams) - www.polyvision.com
 - 3. ADP Lemco, Inc. - www.adplemco.com

2.2 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Color: White.
 - 2. Steel Face Sheet Thickness: 24 gage, 0.0239 inch
 - 3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.

4. Backing: Aluminum foil, laminated to core.
 5. Size: As indicated on drawings.
 6. Frame: Extruded aluminum, with concealed fasteners.
 7. Frame Finish: Anodized, natural.
 8. Accessories: Provide map rail and marker tray.
- B. Tackboards: Composition cork.
1. Cork Thickness: 1/8 inch.
 2. Color: As selected from manufacturer's full range.
 3. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 5. Size: As indicated on drawings.
 6. Frame: Extruded aluminum, with concealed fasteners.
 7. Frame Profile: Manufacturer's standard
 8. Frame Finish: Anodized, natural.
 9. Accessories: Provide map rail and flag holder.

2.3 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

2.4 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board .
- E. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.

- B. Secure units level and plumb.

3.3 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1200 - DISPLAY CASES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bulletin boards.
 - 2. Display cases.

1.2 DEFINITIONS

- A. Bulletin Board: Glazed cabinet with tackboard panel, without shelves, typically of shallow depth for display of paper documents.
- B. Display Case: Glazed cabinet with adjustable shelves.
- C. Tackboard Panel: A material for holding push-pins or tacks, typically consisting of a facing such as fabric, vinyl, or cork; adhered to a substrate such as fiberboard, hardboard, or particleboard.

1.3 REFERENCES

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ANSI A135.4 - American National Standard for Basic Hardboard.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- E. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
- H. ASTM D4802 - Standard Specification for Poly(Methacrylate) Acrylic Plastic Sheet.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. BHMA A156.9 - American National Standard for Cabinet Hardware.
- K. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- L. NAAMM/NOMMA AMP 500 - Metal Finishes Manual.
- M. NFPA 70 - National Electrical Code.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
 - 2. Include electrical characteristics for illuminated display cases.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For display cases.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show location of seams and joints in tackboard panels.
 - 3. Include sections of typical trim members.
 - 4. Include diagrams for wiring of illuminated display cases.
- D. Samples: For each exposed product and for each color and texture specified; not less than 8-1/2 by 11 inches (215 by 280 mm) for tackboard panels and 6 inches (150 mm) long for trim with factory finish.
- E. Samples for Initial Selection: For each type of exposed finish.
 - 1. Include Samples of tackboard panels and factory-finished trim involving color finish selection.
- F. Samples for Verification: For each type of exposed finish for the following.
 - 1. Tackboard Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- (150-mm-) long sections of each trim profile.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For fabrics, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For display cases to include in maintenance manuals.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient

temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain display cases from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 BULLETIN BOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. A-1 Visual Systems.
 - 2. AARCO Products, Inc.
 - 3. ADP Lemco.
 - 4. AJW Architectural Products.
 - 5. Architectural School Products Ltd.
 - 6. Aywon.
 - 7. CIG-JAN Products Ltd.
 - 8. Claridge Products and Equipment, Inc.
 - 9. Ghent Manufacturing, Inc.
 - 10. Laurence, C. R. Co., Inc.
 - 11. Marsh Industries, Inc.
 - 12. Moore Co, Inc.
 - 13. Nelson-Harkins Industries.
 - 14. Peter Pepper Products, Inc.
 - 15. Platinum Visual Systems.
 - 16. Poblocki Sign Company.
 - 17. Pyramid Presentation Products.
 - 18. Signature, Inc.
 - 19. Swingframe Mfg.; a division of Access Display Group, Inc.
 - 20. Tablet & Ticket Co. (The).
 - 21. Visiontron Corp.
 - 22. Vomar Products, Inc.
 - 23. Waddell Furniture; a division of Ghent Manufacturing, Inc.
- B. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard panel on back inside surface and operable glazed doors at front.
 - 1. Frame and Cabinet Profile: Square frame section with square cabinet corners.
 - 2. Mounting: Surface mounted.
 - 3. Size: As indicated on Drawings.

- C. Aluminum-Framed Cabinet: Extruded aluminum; with clear anodic finish.
 - 1. Color: As selected by Architect from manufacturer's full range.
- D. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - 1. Thickness: Not less than 5 mm thick.
 - 2. Number of Doors: One.
- E. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
 - 1. Thickness: Not less than 5 mm thick.
 - 2. Number of Doors: One.
- F. Header Panel: Nonilluminated; with opaque acrylic sheet panel set within overall cabinet frame; with matching frame that separates header panel from bulletin board.
 - 1. Graphic Content and Style: Provide header panel copy that complies with requirements indicated on Drawings for size, style, spacing, content, height, location, material, and colors of graphics.
 - 2. Color: As selected by Architect from full range of industry colors.
- G. Illumination System: Concealed top-lighting system consisting of fluorescent-strip fixtures. Include lamps and internal wiring with single, concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - 1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
 - a. Electrical Characteristics: Single-phase, 120 V.
- H. Back Panel: Manufacturer's standard natural-cork tackboard panel.

2.4 DISPLAY CASES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. A-1 Visual Systems.
 - 2. AARCO Products, Inc.
 - 3. ADP Lemco.
 - 4. AJW Architectural Products.
 - 5. Architectural School Products Ltd.
 - 6. Ay won.
 - 7. CIG-JAN Products Ltd.
 - 8. Claridge Products and Equipment, Inc.
 - 9. Ghent Manufacturing, Inc.
 - 10. Nelson-Harkins Industries.
 - 11. Peter Pepper Products, Inc.
 - 12. Platinum Visual Systems.
 - 13. Poblocki Sign Company.
 - 14. Pyramid Presentation Products.
 - 15. Tablet & Ticket Co. (The).
 - 16. Waddell Furniture; a division of Ghent Manufacturing, Inc.
 - 17. Advanced Specialties Inc.; Recessed, Double-sided Display Case:
www.advanced-specialties.com/.

- B. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Display Case Cabinet: Hardwood veneer plywood.
 - a. Veneer Species: Maple with natural lacquered finish.
 - 2. Face Frame: Aluminum.
 - 3. Aluminum Finish: Clear anodic.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - 1. Thickness: Not less than 5 mm thick.
 - 2. Number of Doors: Two.
- D. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
 - 1. Thickness: Not less than 5 mm thick.
 - 2. Number of Doors: One.
- E. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - 1. Shelf Depth: 6 inches (150 mm).
 - 2. Number of Shelves: As indicated on Drawings.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards extending full height of display case.
- G. Back Panel:
 - 1. Hardwood veneer to match cabinet.
 - 2. Glass for double-sided access where indicated on the drawings.
- H. Illumination System: Concealed top-lighting system consisting of fluorescent-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - 1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
 - a. Electrical Characteristics: Single phase, 120 V.
- I. Size: As indicated on Drawings.

2.5 TACKBOARD PANELS

- A. Natural-Cork Tackboard Panel: 1/16-inch- (1.6-mm-) thick, natural-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
- B. Natural-Cork Tackboard Panel: 1/8-inch- (3-mm-) thick, natural-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.
- C. Natural-Cork Tackboard Panel: 1/4-inch- (6-mm-) thick, natural-cork sheet factory laminated to 1/4-inch- (6-mm-) thick, hardboard backing.

2.6 MATERIALS

- A. Composite Wood Products: Products shall be made without urea formaldehyde.

- B. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Hardboard: ANSI A135.4, tempered.
- D. Fiberboard: ASTM C208.
- E. Hardwood Plywood: HPVA HP-1.
- F. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- G. Extruded-Aluminum Bars and Shapes: ASTM B221 (ASTM B221M), Alloy 6063.
- H. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.
- I. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- J. Translucent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished). Provide white-colored sheet unless otherwise indicated, of density required to produce uniform brightness and minimum halation effects.
- K. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.
- L. Adhesives: Do not use adhesives that contain urea formaldehyde.
- M. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FABRICATION

- A. Fabricate bulletin boards to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Bulletin Boards: Attach units to wall surfaces with concealed clips, hangers, or grounds.
- C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.
- D. Comply with requirements specified elsewhere for connecting illuminated display cases.
- E. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended in writing by manufacturer.

- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION

SECTION 10 1400 - SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Emergency evacuation maps.
- D. Building identification signs.
- E. Plaque.
- F. Traffic signs.

1.2 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- D. State of Maryland (IAC/PSCP) - Administrative Procedures Guide, revised February 2017.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- E. Verification Samples: Submit samples showing colors specified.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Flat Signs:
 - 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 2. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com/#sle.
 - 3. FASTSIGNS: www.fastsigns.com/#sle.
 - 4. Inpro: www.inprocorp.com/#sle.
- B. Dimensional Letter Signs:
 - 1. Cosco Industries: www.coscoarchitecturalsigns.com/#sle.
 - 2. FASTSIGNS: www.fastsigns.com/#sle.
 - 3. Inpro: www.inprocorp.com/#sle.
- C. Other Signs - Interior Directional and Informational Signs:
 - 1. Construction Specialties, Inc.; Acrovyn: www.c-sgroup.com/.
- D. Plaques:
 - 1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
 - 2. FASTSIGNS: www.fastsigns.com/#sle.

2.2 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.

3. Character Height: 1 inch.
 4. Sign Height: 2 inches, unless otherwise indicated.
 5. Classroom Doors: Identify with the room names and numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
 6. Office Doors: Identify with the room numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
 7. Conference and Meeting Rooms: Identify with the room numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
 8. Service Rooms: Identify with the room names and numbers indicated on drawings.
 9. Rest Rooms: Identify with pictograms, the names "BOYS" and "GIRLS", room numbers indicated on the drawings, and braille.
 10. Identify room numbers on the interior side of each door with corresponding prefix.
 - a. Mount above all doors.
- C. Interior Directional and Informational Signs:
1. Sizes: As indicated on drawings.
- D. Emergency Evacuation Maps:
1. Allow for one map per elevator lobby.
 2. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
- E. Building Identification Signs:
1. Opaque Walls: Printed letters on sheet metal.
 - a. Provide size, font and colors indicated on the drawings.
 - b. Provide 1/4" rounded corners with pre-drilled holes for mechanical fastening at each corner.
 2. Glazed Walls and Doors with Glazed Transoms: Die-cut vinyl letters applied to interior face of glazing immediately above door leaf.
 - a. Provide size, font and color indicated on the drawings.
 3. Mount above all exterior doors, except the main entrance.
 4. Number doors numerically in a clockwise direction beginning with the door immediately to the left of the main entrance, then as indicated on the drawings.
- F. Plaque:
1. Provide one plaque, 12 x 18 inches, in accordance with State of Maryland requirements.
- G. Traffic Signs: To match AHJ standards; locate where indicated on drawings.

2.3 SIGN TYPES

- A. Flat Signs: Signage media without frame.
1. Edges: Square.
 2. Corners: Radiused.
 3. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica.
 2. Character Case: Upper case only.
 3. Background Color: As selected by Architect from manufacturer's custom range.
 4. Character Color: Contrasting color.

2.4 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/16 inch.

2.5 NON-TACTILE SIGNAGE MEDIA

- A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
 - 1. Product: Construction Specialties, Inc.; Acrovyn by Design: www.c-sgroup.com/.
 - 2. Sign Color: Clear.
 - a. High definition graphic file reverse printed on clear sheet and sealed with protective backer.
 - b. Texture: Standard suede.
 - 3. Total Thickness:.040" inch.
 - 4. Accessories:
 - a. Aluminum trims with color anodized finish, as selected by Architect from manufacturer's standard range.
 - b. Adhesive: As recommended by panel manufacturer.

2.6 PLAQUES

- A. Metal Plaques:
 - 1. Metal: Aluminum casting.
 - 2. Metal Sheet Thickness: 1/8 inch, minimum.

2.7 DIMENSIONAL LETTERS

- A. Plastic Letters:
 - 1. Material: Injection molded plastic.
 - 2. Color: As selected.
 - 3. Mounting: Concealed screws.
 - 4. Location: Reception and Main Entrance Vestibule only.

2.8 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 1500 - VIDEO DISPLAY SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Panelized LED video display systems.

1.2 REFERENCE STANDARDS

- A. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification.
- B. UL 879 - Electric Sign Components.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting two weeks prior to the start of the work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's data sheets on panelized LED display systems including recommendations for preparation, storage and handling, and installation.
- B. Shop Drawings: Indicate cable routing, connections between equipment, anchor and support details, and adjacent construction.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. System Setting Backup: Provide an electronic file of all system settings.
- E. Security Items:
 - 1. Provide one set of keys for each locked equipment enclosure.
 - 2. Provide passwords to access control functions for hardware and software user interfaces.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Authorized Manufacturer Representative: System shall be configured and commissioned by an authorized manufacturer representative.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in compliance with manufacturer instructions.

1.7 WARRANTY

- A. Provide lifetime subscription manufacturer warranty for full system at time of initial purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Watchfire Signs, LLC: www.watchfiresigns.com/.

2.2 PANELIZED LED VIDEO DISPLAY

- A. Performance Requirements:
 - 1. Comply with performance standards based on tests conducted in accordance with ANSI/Infocomm 10.
 - 2. Provide products that are listed and labeled as complying with UL 879, where applicable.
- B. System Type: Flat.
 - 1. Pixel Pitch: 16mm
 - 2. Horizontal Viewing Angle: 170 degrees (plus/minus 85 degrees off center).
 - 3. Vertical Viewing Angle: 160 degrees (plus/minus 80 degrees off center).
 - 4. Brightness: 1000 Nits adjustable
 - 5. Mount Type: Free Standing/Self Supporting.
 - 6. Location: Outdoor.
 - 7. Total Height: 3 ft.
 - 8. Total Length: 6 ft.
 - 9. Panel Height: 12 inches.
 - 10. Panel Length: 12 inches.
 - 11. Service Access: Front.
 - 12. Data Connections: Wireless with the ability for hard wire connection(s).

2.3 CONTROLS

- A. Interface Unit:
 - 1. With the following abilities; scale media, rotate media, adjust brightness, loop output, and input selection.
 - 2. Working Voltage: 120 VAC / 240 VAC at 60Hz.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates and support structure is in place and properly prepared.
- B. Verify that required power and data sources are provided.
- C. Verify that space is available for centrally located components.
- D. Notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare substrates using the methods recommended by the manufacturer for achieving the best result under the project conditions.

- B. Do not proceed with installation until support structure and substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions .
- B. Install message center and signs level and plumb with fasteners recommended by the manufacturer.
- C. Record any necessary changes to the system design.

3.4 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation and maintenance of equipment to Owner's designated representative.
- B. Review service and support contacts.

3.5 PROTECTION

- A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 10 2113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.2 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For toilet compartments having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**
- D. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.
- E. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
 - 2. Partition Systems International of South Carolina: www.psisc.com/#sle.
 - 3. Scranton Products (Santana/Comtec/Capital): www.scrantonproducts.com/#sle.
 - 4. ASI American Specialties, Inc.: <https://globalpartitions.com/>.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Color: Single color as selected.
 - 2. Doors:
 - a. Thickness: 1 inch.
 - b. Width: 24 inch.
 - c. Width for Handicapped Use: 36 inch, out-swinging.
 - d. Height: 55 inch.
 - 3. Panels:
 - a. Thickness: 1 inch.
 - b. Height: 55 inch.
 - 4. Pilasters:
 - a. Thickness: 1 inch.
 - b. Width: As required to fit space; minimum 3 inch.
 - 5. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets.
 - 6. **Sustainable Design Requirements:**
 - a. **MR Credit 3: BPDO - Sourcing of Raw Materials: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.**

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
- E. Hinges: Stainless steel, manufacturer's standard finish.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2123 - CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface mounted overhead curtain track and guides.
- B. Cubicle curtains.

1.2 REFERENCE STANDARDS

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

1.3 SUBMITTALS

- A. Product Data: Provide data for curtain fabric characteristics.
- B. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.
- C. Samples: Submit two fabric samples, 6 by 6 inch in size illustrating fabric color.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Curtains: Two of each type and size.
 - 2. Extra Carriers: Ten.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept curtain materials on site and inspect for damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cubicle Track and Curtains:
 - 1. A. R. Nelson Co: www.arnelson.com/#sle.
 - 2. C/S General Cubicle: www.c-sgroup.com/cubicle-track-curtains/#sle.
 - 3. Inpro: www.inprocorp.com/#sle.

2.2 TRACKS AND TRACK COMPONENTS

- A. Tracks: Extruded aluminum sections; one piece per track run.
 - 1. Profile: Channel.
 - 2. Mounting: Surface.
 - 3. Track End Stop: To fit track section.

4. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
 5. Finish on Exposed Surfaces: White enamel.
- B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.
- C. Wand: Plastic, attached to lead carrier, for pull-to-close action.
- D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.3 CURTAINS

- A. Cubicle Curtains:
1. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 2. Material: Close weave recycled content and eco-polyester material; anti-bacterial, self deodorizing, sanitized, and preshrunk.
 3. Color/Pattern: As selected by Architect from manufacturer's full range.
 4. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, white color.
 5. Attachment of Curtain Fabric to Open Mesh Cloth: Manufacturer's standard sewn seam.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

3.2 INSTALLATION

- A. Install curtain track to be secure, rigid, and true to ceiling line.
- B. Secure track to ceiling system.
- C. Install end cap and stop device.
- D. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 2239 - FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Top-supported folding panel partitions, horizontal opening.
- B. Acoustic operable panel partition.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- C. ASTM E413 - Classification for Rating Sound Insulation.
- D. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1. Require attendance by representatives of installer.
 - 2. Notify Architect one week in advance of scheduled meeting date.

1.4 SUBMITTALS

- A. Product Data: Provide data on partition materials, operation, hardware and accessories, track switching components, and colors and finishes available.
- B. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, adjacent construction and finish trim, and stacking depth.
- D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
- E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.
- F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- G. Manufacturer's Instructions: Indicate special procedures.

- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until installation.

1.7 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within five year period after Date of Substantial Completion.
- C. Provide ten year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Folding Panel Partitions - Horizontal Opening:
 - 1. Hufcor, Inc: www.hufcor.com/#sle.
 - 2. Moderco, Inc: www.moderco.com/#sle.
 - 3. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.

2.2 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

- A. Folding Panel Partitions: Side opening; individual or paired panels as indicated in the schedule below; side stacking; manually operated.
- B. Panel Construction:
 - 1. Frame: 16 gage, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
 - 2. Panel Properties:
 - a. Thickness With Finish: 3 inches.
 - b. Width: Equal widths, up to 48 inches.
- C. Panel Finishes:
 - 1. Facing: Vinyl coated fabric, markerboard and/or tackboard as indicated on Drawings.
 - 2. Exposed Metal Trim: Custom powder coated paint finish.
- D. Panel Seals:
 - 1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
 - 2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

- E. Suspension System:
 - 1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
 - 2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
 - 1. Acoustic Performance:
 - a. Sound Transmission Class (STC): 48 to 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
 - 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Accessories:
 - 1. Pocket Enclosures: Door, frame, and trim to match adjacent walls.
 - 2. Acoustic Sealant: As recommended by partition manufacturer.

2.3 MATERIALS

- A. Markerboard: Porcelain enamel on steel, laminated to core; color as selected.
- B. Tackboard: Natural, light brown, fine grained cork; 0.5 inch thick; color as selected from manufacturer's standard range.
- C. Acoustic Insulation:
 - 1. Type: As required for acoustic performance indicated.
 - 2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
- C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

3.2 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Fit and align partition assembly and pocket doors level and plumb.
- C. Install acoustic sealant to achieve required acoustic performance.
- D. Coordinate electrical connections.

3.3 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.4 CLEANING

- A. Clean finish surfaces and partition accessories.
- B. Condition markerboard surfaces in accordance with manufacturer's instructions.

3.5 SCHEDULES

- A. Platform: Single panel type.
- B. Cafeteria/Gymnasium: Continuous Hinged, paired panel type.

END OF SECTION

SECTION 10 2600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Corner guards.

1.2 REFERENCE STANDARDS

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

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, and anchorage details.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 24 inches long.
- D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: Five minimum 48 inches long unit of covers for corner guards.
- G. Maintenance Data: For each type of product . Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Store products in either horizontal or vertical position, in conformance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 PRODUCT TYPES

- A. Corner Guards - Surface Mounted, Transparent Plastic:
 - 1. Material: Clear polycarbonate, extruded.
 - 2. Thickness: 0.075 inch.

3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Width of Wings: 2-1/2 inches, with radiused corner and rounded wing tips.
6. Corner Angle: 90 degrees.
7. Length: One piece, 48 inches.
8. Mounting: Translucent double-faced, factory-applied tape.

2.2 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- C. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches above finished floor to height of corridor wall tile.

3.3 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Under-lavatory pipe supply covers.
- D. Diaper changing stations.
- E. Utility room accessories.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM C1036 - Standard Specification for Flat Glass.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- D. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.4 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- B. Samples: Submit two samples of each accessory, illustrating color and finish.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. NPS Corporation: www.npscorp.com/.
 - 3. Dispensing Dynamics International: www.dispensingdynamics.com/.
- B. Diaper Changing Stations:

1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Bradley Corporation: www.bradleycorp.com/#sle.
3. Koala Kare Products: www.koalabear.com/#sle.

C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.
- C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- D. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.3 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, plastic.
 1. Products:
 - a. Dispensing Dynamics International; 5" Conventional Twin Tissue Dispenser: www.dispensingdynamics.com/.
- B. Paper Towel Dispenser: Mechanical, roll paper type.
 1. Cover: Translucent plastic.
 2. Paper Discharge: Pull dispense.
 3. Capacity: 6 inch diameter roll.
 4. Mounting: Surface mounted.
 5. Refill Indicator: Transparent viewing slot.
 6. Products:
 - a. Dispensing Dynamics International; 6" Mini Auto-Cut Towel Dispenser: www.dispensingdynamics.com/.
 - b. Merfin; Exclusive Dispenser for Hard Roll Towels: www.npscorp.com/.
- C. Soap Dispenser: Owner furnished, Contractor installed.
- D. Hand Sanitizer Dispenser: Owner furnished, Contractor installed.
- E. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 1. Size: As indicated on drawings.
 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
- F. Grab Bars: Stainless steel, smooth surface.
 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.

- G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.4 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
- B. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Color: As selected from manufacturer's standard colors.
 - 3. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, location as indicated on Drawings seat.
 - 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
 - 2. Size: ADA Standards compliant.
- D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
- E. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
 - 1. Length: 18 inches.

2.5 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Specified in 22 4000 - Plumbing Fixtures.

2.6 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Color: White.

2.7 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 - 4. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. See Section 06 1000 for installation of blocking in walls.

3.2 PREPARATION

- A. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide.
- B. NFPA 10 - Standard for Portable Fire Extinguishers.
- C. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, and anchorage details.
- B. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, and accessories required for complete installation.

1.4 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business: www.ansul.com/#sle.
 - 2. Nystrom, Inc: www.nystrom.com/#sle.
 - 3. Activar Construction Products Group - JL Industries: www.activarcpg.com/.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
 - 2. Ansul, a Tyco Business: www.ansul.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.

2.2 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. FE-36 Clean Agent Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 1. Class: A:B:C type.
 2. Size: 5 pound.
 3. Finish: Polished chrome.
 4. Temperature Range: Minus 40 degrees F to 120 degrees F.

2.3 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 1. Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Semi-recessed type.
 1. Size to accommodate accessories.
 2. Trim: Flat rolled edge, with 1.75 inch wide face.
- C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
- D. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- H. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 24 inches from finished floor to bottom of cabinet.
- C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets and on wall brackets.

END OF SECTION

SECTION 10 5113 - METAL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal lockers.
- B. Locker benches.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- B. Shop Drawings: Indicate locker plan layout, numbering plan.
- C. Samples: Submit two samples 2 by 2 inches in size showing color and finish of metal locker material.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Lockers:
 - 1. Art Metal Products: www.artmetalproducts.com/#sle.
 - 2. Lockers MFG: www.lockersmfg.com/#sle.
 - 3. Penco Products, Inc: www.pencoproducts.com/#sle.

2.2 LOCKER APPLICATIONS

- A. Student Lockers: Metal lockers, wall mounted for base indicated on drawings.
 - 1. Width: 12 inches.
 - 2. Depth: 12 inches.
 - 3. Height: 48 inches.
 - 4. Configuration: Single and double-tier where indicated on the drawings.
 - 5. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Hooks: One single prong.
 - 6. Ventilation: Louvers at top and bottom of door panel.

7. Locking: Padlock hasps, for padlocks provided by Owner.
 8. Provide sloped top.
- B. Locker Benches: Stationary type; bench top of laminated birch; painted steel pedestals.
1. Accessibility: Comply with ICC A117.1 and ADA Standards.

2.3 METAL LOCKERS

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
1. Where ends or sides are exposed, provide flush panel closures.
 2. Provide filler strips where indicated, securely attached to lockers.
 3. Color: To be selected by Architect.
- C. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
1. Body and Shelves: 24 gage, 0.0239 inch.
 2. Base: 20 gage, 0.036 inch.
 3. Metal Base Height: 4 inch.
- D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
1. Door Frame: 16 gage, 0.0598 inch, minimum.
- E. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
1. Door Outer Face: 18 gage, 0.0478 inch, minimum.
 2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
 3. Form recess for operating handle and locking device.
 4. Multi-point Latch: 2 latch hooks for doors under 48"; 3 latch hooks for doors over 48".
 - a. Spring-activated, nylon slide type; enclosed within the lock channel.
 - b. Finger lift control type; nylon covered steel: 14 gage, 0.078125" inch, minimum.
- F. Hinges: Heavy duty, 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.
- G. Sloped Top: 20 gage, 0.0359 inch, with closed ends.
- H. Trim: 20 gage, 0.0359 inch.
- I. Coat Hooks: Stainless steel or zinc-plated steel.
- J. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.
- K. Locks: Padlocks to be provided by Owner.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install fittings if not factory installed.
- H. Replace components that do not operate smoothly.

3.3 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 5613 - METAL STORAGE SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Four post shelving.
- B. Shelving accessories.

1.2 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
- B. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
- C. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.6 WARRANTY

- A. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Four Post Shelving:
 - 1. Hallowell: www.hallowell-list.com/#sle.
 - 2. Montel: www.montel.com/#sle.
 - 3. Penco Products, Inc: www.pencoproducts.com/#sle.

2.2 SHELVING - GENERAL

- A. See drawings for layout and sizes.
- B. Seismic Design: Design for Seismic Zone 4, in accordance with ASCE 7, Section 9.
- C. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 - 1. Provide hardware of type recommended by manufacturer for substrate.

2.3 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Unit Width: 24 inches, center to center of posts.
 - 2. Shelf Capacity: Uniform distributed load of 50 psf, minimum.
 - 3. Adjustability of Shelving: At intervals of 6 inches on center, minimum.
 - 4. Clear Shelf Opening Height: 18 inches, minimum.
 - 5. Finish: Baked enamel, medium gloss.
 - 6. Color: As selected by Architect from manufacturer's standard range.
 - 7. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.
 - 1. Metal Thickness: 16 gage, 0.0598 inch.
 - 2. Post Shape: Tee intermediate posts, angle end posts forming corners.
 - 3. Post Face Width: 2 inches, maximum.
 - 4. Connecting Hardware: Manufacturer's standard.
- C. Bracing: Formed sheet members.
 - 1. Back Sway Bracing: Either strap or panel; at back of each unit.
 - 2. Side Sway Bracing: Either strap or panel; at each side of each unit.
 - 3. Strap Sway Bracing: One strap installed diagonally, 16 gage, 0.0598 inch; welded, riveted, or bolted to uprights.
 - 4. Panel Sway Bracing: Formed sheet metal panels, 20 gage, 0.0359 inch; welded, riveted, or bolted to uprights.
- D. Shelves: Formed sheet, finished on all surfaces.
 - 1. Metal Thickness: 16 gage, 0.0598 inch.
 - 2. Shelf Connection to Posts: Manufacturer's standard.

2.4 OTHER STORAGE SYSTEMS

- A. Wall-mounted interior Storage Rail: Provide in Pre-Kindergarten and Kindergarten storage rooms with direct access to exterior.
 - 1. Length: 120 inches.
 - 2. Mounting Height: 60 inches above finished floor.
 - 3. Mounting Hooks: 5 hooks per rail.
 - 4. Manufacturers:
 - a. Rubbermaid; FastTrack Rail System: www.rubbermaid.com/ (or approved equal).

2.5 ACCESSORIES

- A. Label Holders: Steel, attached to front face of shelf.
 - 1. Size: 2-1/4 by 3/4 inches.
 - 2. Finish: Manufacturer's standard.
 - 3. Mounting: Slide-on.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Verify that walls are suitable for shelving attachment.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.4 CLEANING

- A. Clean shelving and surrounding area after installation.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 7500 - FLAGPOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Flagpoles.

1.2 REFERENCE STANDARDS

- A. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
- B. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.

1.3 SUBMITTALS

- A. Product Data: Provide data on pole, accessories, and configurations.
- B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.1 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001.
 - 1. Material: Aluminum.
 - 2. Design: Straight shaft.
 - 3. Mounting: Ground mounted type.
 - 4. Nominal Height: 20 ft; measured from nominal ground elevation.
 - 5. Halyard: Interior type.
 - a. Provide access panel and 6 keys.
- B. Performance Requirements:
 - 1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 80 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.2 POLE MATERIALS

- A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper.

2.3 ACCESSORIES

- A. Finial Ball: Aluminum, 5 inch diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch size, aluminum with galvanized steel fastenings, two per halyard.
- D. Halyard: 5/16 inch diameter polypropylene, braided, white.
 - 1. Equipped to fly two flags, minimum, simultaneously.
 - 2. Provide two attachment clips per flag.

2.4 MOUNTING COMPONENTS

- A. Pole Base Attachment: Sleeve; steel base with base cover.

2.5 FINISHING

- A. Aluminum: Mill finish.
- B. Finial: Spun finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.2 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.3 INSTALLATION

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1 inch.

3.5 ADJUSTING

- A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 3013 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.

1.2 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.5 WARRANTY

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES

- A. **Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.**
- B. Refrigerator: Free-standing, top-mounted freezer, and frost-free.
 - 1. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 - 3. Features: Include glass shelves and automatic icemaker.
 - a. Ice maker: Provide documentation demonstrating air-cooled or closed-loop cooling system.
 - 4. Exterior Finish: Porcelain enameled steel, color white.
- C. Refrigerator: Free-standing, undercounter, and frost-free.

1. Capacity: Total minimum storage of 4.4 cubic ft.
 2. Energy Usage: Energy Star Qualified, minimum.
 3. Features: Include glass shelves.
 4. Exterior Finish: Porcelain enameled steel, color white.
- D. Range: Electric, free-standing, with glass-ceramic cooktop.
1. Size: 30 inches wide.
 2. Oven: Self-cleaning with electronic ignition.
 3. Elements: Four (4).
 4. Controls: Solid state electronic.
 5. Features: Include storage drawer, oven door window, and oven light.
 6. Exterior Finish: Porcelain enameled steel, color white.
- E. Cooking Exhaust: Range hood.
1. Size: 30 inches wide.
 2. Fan: Two-speed, 500 cfm
 3. Exhaust: Recirculating.
 4. Features: Include cooktop light and removable grease filter.
 5. Exterior Finish: Painted steel, color white.
- F. Microwave: Countertop.
1. Capacity: 0.7 cubic ft.
 2. Power: 700 watts.
 3. Features: Include turntable and 2-speed exhaust fan.
 4. Exterior Finish: White.
 5. Manufacturers:
 - a. Same as Refrigerator.

2.2 LAUNDRY APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Clothes Washer: Front-loading.
1. Size: Compact; stackable unit with Dryer.
 2. Controls: Solid state electronic.
 3. Cycles: Include normal.
 4. Motor Speed: Single-speed.
 5. Features: Include optional second rinse, bleach dispenser, fabric softener dispenser, self-cleaning lint filter, sound insulation, and end of cycle signal.
 6. Finish: Painted steel, color white.
 7. Manufacturers:
 - a. Same as Clothes Dryer.
- C. Clothes Dryer: Electric, stationary.
1. Size: Compact; stackable unit with Dryer.
 2. Controls: Solid state electronic, with electronic moisture-sensing dry control.
 3. Temperature Selections: One.
 4. Cycles: Include normal, permanent press, knit/delicate, and air only.
 5. Features: Include interior light, reversible door, sound insulation, and end of cycle signal.
 6. Finish: Painted steel, color as indicated.
 7. Manufacturers:
 - a. Same as Clothes Washer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.3 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.4 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

SECTION 11 4000 – FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Scope: Furnish all labor, materials, services, equipment and appliances required to provide and deliver all foodservice equipment hereinafter specified into the building, uncrate, assemble, hang, set-in-place, level, and completely install, exclusive of final utility connections.
- B. Related Work Specified Elsewhere:
 - 1. All plumbing, electrical and ventilating work required in conjunction with commercial foodservice equipment including rough-in to points indicated on mechanical drawings, and final connections from rough-in points, electrical service to points of connection and final connections shall be by Divisions 22, 23 and 26.
 - 2. Refrigeration work will be done by the Kitchen Equipment Contractor except for electrical and plumbing connections to and between compressors, blower coils, controls, etc. These final connections shall be by Divisions 22 and 26.
 - 3. All traps, steam traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs, and fittings necessary for equipment specified will be furnished and installed under mechanical contract by Division 22 unless specifically called for otherwise under each item.
 - 4. All line and disconnect switches, safety cut-offs and fittings, convenience boxes or other electrical controls, fittings and connections will be furnished and installed under electrical contract by Division 26, unless specifically indicated otherwise in the item specifications. Starting switches for certain specified pieces of foodservice equipment are to be provided by Kitchen Equipment Contractor. Those starting switches, if furnished loose as standardized by Foodservice Manufacturers (other than fabricated items), shall be mounted and wired complete under Division 26.
 - 5. Any sleeves or conduit required for refrigeration, syrup tubing, or carbonation tubing will be furnished and installed under Division 22.
 - 6. Unless specifically called for in the Item Specifications, ventilating fans and all duct work between same and ceiling rough-in openings, and from same to discharge opening in building will be furnished and installed by Division 22.

1.2 DEFINITIONS:

- A. All references to the terms "Contractor", "Kitchen Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.
- B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative and the Foodservice Equipment Consultant.
- C. All references to the term "Consultant" or "Foodservice Equipment Consultant" in the specifications and/or on the drawings shall be defined to mean **NYIKOS ASSOCIATES, INC.** its employees, and authorized representatives and is referred to throughout the contract documents as if singular in number and masculine in gender.

- D. The phrase "The K.E.C. shall" or "by the K.E.C.", as applicable, is understood to be included as a part of each sentence, paragraph or article of these specifications unless otherwise indicated or specified.

1.3 QUALITY ASSURANCE:

A. Qualification of Suppliers:

1. Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.
 - a. Successful completion of jobs of comparable scope.
 - b. Have manufacturer's authorization to distribute and install specified factory items of equipment.
 - c. Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style rough-in drawings and brochures.
 - d. Maintain or have access to fabrication shop meeting N.S.F. requirements. If other than foodservice equipment suppliers own fabrication shop, obtain Consultant approval of fabrication shop desired to be used.
 - e. Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.

B. Qualification of Fabricators:

1. Fabricators shall be an N.S.F. approved organization with trained personnel and facilities to properly design, detail and fabricate equipment in accordance with the specifications and standard details contained herein.
2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval and listed as such under N.S.F. Standards No. 2 and No. 33.
3. Only one (1) fabricator shall be used for this project, and all equipment will be fabricated at the same shop. When units cannot be fully shop-fabricated, complete fabrication at project site.
4. Acceptable fabricators are:
 - a. Pro Stainless, Inc.; Keyser, WV
 - b. Commercial Stainless, Inc.; Bloomsburg, PA
 - c. Keystone Custom Fabricators, Inc.; Elizabeth, PA
 - d. Southern Equipment Fabricators, Inc.; Columbia, SC
 - e. Stainless Unlimited, Inc., Waldorf, MD
 - f. Other fabricators, as approved by Consultant.

C. Qualification of Manufacturers:

1. Manufacturers shall be regularly engaged in the production of items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

D. Standard Products:

1. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturer's latest design that complies with the specifications which have been produced and used successfully on other projects and in similar applications.
2. Discrepancies within contract documents should immediately be brought to the attention of the Consultant in writing for clarification prior to fabrication or ordering of standard items.

1.4 PLANS & SPECIFICATIONS:

- A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, drawings shall govern. Bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

1.5 SUBMITTALS:

- A. General Requirements:
 - 1. Within six (6) weeks or earlier, as required, assemble and submit all shop drawings, rough-in drawings, brochures, color samples, etc. as a complete package. There will be no review of partial submittals.
 - 2. Any and all costs, to all trades and parties involved, arising from delay of project due to non-submittal of the complete package by the K.E.C. within a reasonable time period shall be borne solely by the K.E.C.
 - 3. Identify each submittal by project name, date, contractor, submittal name, and any other necessary information to distinguish it from other submittals.
- B. LEED Submittals: Comply with Section 01 3329.
 - 1. Water Efficiency Prerequisite 2: Indoor Water Use Reduction
 - a. Hand washing sink faucets: Water usage in gallons per minute (gpm)
 - b. Pre-rinse spray valves: Water usage in gallons per minute (gpm)
 - c. Commercial dishwashers: ENERGY STAR: Water usage in gallons per rack
 - d. Ice machine: ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2019 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins.
 - 3. EA Prerequisite 4: Fundamental Refrigerant Management and EA Credit 6: Enhanced Refrigerant Management
 - a. Documentation for equipment containing refrigerants over one-half (0.5) pound, stating type and quantity of refrigerant.
- C. Shop Drawings:
 - 1. Submit shop drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of equipment specified for custom fabrication including all accessories attached to each item.
 - 2. Drawings shall be detailed and fully dimensioned to a minimum scale of 3/4"=1'-0" for plan and elevation views, and 1-1/2"=1'-0" for sections, based on the floor plan(s) and following item specifications. Drawings will be checked for thoroughness, accuracy, completeness, neatness, and returned for corrections, if necessary.
- D. Rough-in Drawings:

1. Submit rough-in drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of detailed arrangement plans professionally prepared from architects dimensioned plans (not traced from Contract Documents) at a minimum scale of 1/4"=1'-0".
 2. Equipment Layout Plan showing arrangement of all items specified and identified on schedule of equipment listing item number, description, quantity, manufacturer, model number, and remarks.
 3. Ventilation Plan showing dimensioned locations of all duct openings for ventilators and dishmachines identifying size, c.f.m. required (exhaust and supply), static pressures, and connection heights.
 4. Plumbing/Electrical Plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
 5. Special Conditions Plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations/heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda and compressed gas lines.
- E. Equipment Brochures:
1. Submit electronic files in PDF format of manufacturer's illustrations and technical data for approval prior to procurement. All items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to accurately describe the item to be furnished as specified. Include all deviations from standard information (i.e., voltage, phase, load, etc.).
 2. Include a separate information sheet ahead of each illustration sheet showing all service connection sizes, electrical requirements, loads, consumptions, and all accessories specified.
 3. Manufacturer's suggested schematic drawings for connection of mechanical and electrical services for such items as booster heaters, disposers, or any other item of equipment that may require the same.
- F. Miscellaneous Shop Drawings:
1. Submit electronic files in PDF format of manufactured equipment specified requiring clarification and approval such as, walk-in cooler/freezer drawings, ventilator drawings, utility raceway drawings, and refrigeration system drawings.
- G. Operation and Maintenance Manuals:
1. Submit electronic files in PDF format for all mechanically operated equipment of standard manufacture. Include operating and cleaning/maintenance instructions, parts listing, recommended parts inventory listing and purchase source, copy of warranties, and similar applicable information.
 2. Brochure covers shall bear the job name, date, and name of contractor.
- H. Manufacturer's List:
1. The K.E.C. shall submit electronic files in PDF format a list of all manufacturer's representatives of the food service equipment such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers; to be presented after submission of manufacture data.
- I. Samples:
1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.
- J. Re-submission Requirements:
1. Shop Drawings:

- a. Revise initial drawings as required and resubmit in accordance with submittal procedures.
 - b. Indicate on drawings all changes which have been made in addition to those requested by Consultant.
- 2. Product Data and Samples:
 - a. Submit new data and samples as required for initial submittal.
 - b. Make all re-submittals within fourteen (14) working days from date of Consultants previous action.
- K. Approvals:
 - 1. After approval of the submittals listed above, furnish as many prints and copies as are required for the various trades, the Owner, the Architect, and the Consultant.
 - 2. The approval of the shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, finishing, quantities, and erection of work in strict accordance with the contract requirements, nor does it relieve him of the responsibility of furnishing material and workmanship not indicated on approved shop drawings but required for the completion of his work.
 - 3. Approval by the Consultant and/or Owner of the manufacturer's data submitted by the K.E.C. does not waive the responsibility of K.E.C. to furnish each item of equipment in complete compliance with the specifications and drawings. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approval and installation of this equipment at no additional cost to the Owner.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Delivery:
 - 1. Equipment shall be delivered to the job site only after the building is weather-safe and vandal-safe.
- B. Storage:
 - 1. Store equipment in an area convenient to the point of installation in such a way that it is protected from the weather and job hazards.
- C. Protection:
 - 1. Wrapping and protective coatings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.
- D. Damage:
 - 1. All responsibility shall rest with the K.E.C. for any damage or loss incurred prior to final acceptance. Such items as may be lost or damaged shall immediately be replaced or repaired to a new condition to the complete satisfaction of and at no additional cost to the Owner.

1.7 JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS:

- A. Include the work specified, shown or reasonably inferable as part of foodservice equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.8 REGULATIONS AND CODES:

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section.
 - 1. N.S.F. Standards: Comply with National Sanitation Foundation Standards and criteria, and provide N.S.F. "Seal of Approval" on each manufactured item and major items of custom-fabricated work.
 - 2. U.L. Standards: For electrical components and assemblies, provide either U.L. labeled products or, where no labeling service is available, provide a complete index of the components used as selected from the U.L. "Recognized Component Index".
 - 3. A.N.S.I. Standards: For gas-burning equipment, comply with A.N.S.I. Z21-Series standards. Comply with A.N.S.I. B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for water connection air gaps and vacuum breakers.
 - 4. A.G.A.: All gas-fired equipment shall be A.G.A. Approved, equipped to operate on the type gas available at the job site and shall contain 100% automatic safety shut-off devices.
 - 5. N.F.P.A. Standards: Comply with N.F.P.A. Bulletin 96 for exhaust systems and with N.F.P.A. Bulletins 17 & 96, and U.L. 300 for fire extinguishing systems.
 - 6. A.S.M.E. Code: Comply with A.S.M.E. boiler code requirements for steam generating and steam heated equipment. Provide A.S.M.E. inspection, stamps, and certification of registration with National Board.
 - 7. National Electric Code: Comply with N.E.C. Volume 5 for electrical wiring and devices included with foodservice equipment.
 - 8. All authorities having jurisdiction over this type of equipment and/or installation.
 - 9. Where specifications and/or drawings require mechanical, electrical or refrigeration work to be performed, such work shall be done in strict conformance to other portions of the Base Building Specification which sets forth standards for this type of work.
 - 10. Where there exists two standards or codes for one type of work, the stricter method shall govern.

1.9 WARRANTIES:

- A. Warrantee in writing all equipment and fabrication against defects and workmanship for a period of two (2) year from date of acceptance.
 - 1. Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency whom the Owner will call should malfunctions occur within the two-year (2) guarantee period.
- B. Refrigeration system compressors shall be warrantied for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, shall be furnished for two (2) years from date of acceptance, unless otherwise specified.

1.10 JOB CONDITIONS:

- A. Visit the job site to field check actual wall dimensions and roughing-in and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.
- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjamb, windows, etc. for the purpose of moving the equipment to its proper location with the Contractor. Any removal and rebuilding of walls,

partitions, doorjambs, etc. necessary to place the equipment, or if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the K.E.C., at no additional cost to the Owner.

- C. Notify the Consultant and Owner before fabrication of equipment of any discrepancies between plans and specifications and actual conditions on the job.
- D. Before finished floors, walls, and/or ceilings are in place, physically check the location of all "rough-ins" at the job site. Report discrepancies in writing.
- E. Any changes required after fabrication has been started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional cost to the Owner.
- F. If special hoisting equipment and operators are required, include such cost as part of the bid for this work.

1.11 CHANGES IN THE WORK:

- A. The Owner reserves the right to require reasonable modification to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.12 PATENTS:

- A. Hold harmless and save the Owner and its officers, consultants, servants and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or un-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.
- B. If the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner in writing. The contract price shall include all royalties or costs arising from the use of any or all of the above which are, in any way, involved in the contract.

1.13 CONTRACTOR'S WARRANTY:

- A. The Contractor represents and warrants:
 - 1. That he is financially solvent and that he is experienced in and competent to perform the types of work or to furnish the plans, materials, supplies or equipment, to be so performed or furnished by him.
 - 2. That he is familiar with all Federal, State, municipal, and department laws, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein, including, but not limited to, any special acts relating to the work or to the project of which it is a part.
 - 3. That such temporary and permanent work required by the contract as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.

4. That he has carefully examined the plans, specifications, addenda, if any, and the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may, in any way, affect the work or its performance.
5. That he has satisfied himself as to the existing openings and accesses to the foodservice area through which his equipment shall be required to pass and that he is responsible for his equipment being delivered in as many sections as necessary to conform to the available space dictated by these existing limitations.

1.14 SUBSTITUTIONS:

- A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.
- B. The K.E.C. may quote upon brands and models of equipment other than those specified as a substitute, but he must also bid the primary item. In the event that it is desired to request approval of substitute material, product, article, process, or item of equipment in lieu of that which is specified, submit a written request at the time of submitting bid on a separate sheet attached to, but not part of, the base bid, setting forth the proposed substitution in detail, including an itemized analysis of the addition or deduction in the amount of the contract, if any, which will result if the substitution is approved. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.
- C. The Contractor shall be held responsible for additional costs to himself or any other prime contractor for changes required to install materials, devices, equipment, etc., which the Contractor has substituted for that specified.
- D. The Owner reserves the right to award a contract or contracts based upon the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meaning and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.
- E. Whenever any product is specified in the Contract Documents by reference to the name, trade name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a standard of quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered. However, please take note that the plumbing, electrical, steam, heating, ventilating, and air-conditioning drawings prepared by the consulting engineers, have been engineered based on the first product named under each item number designation. Therefore, any other product which is submitted for approval in lieu of the primary item specified, shall conform to the rough-in requirements established for the first product named, as well as physical size and building construction requirements.
- F. Any equipment listed which is not in accordance with the provisions of these specifications will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant shall then have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these

specifications and will be final and binding, and the items shall be furnished and installed by the Contractor without change in the contract price at the time of completion.

- G. It shall be the responsibility of the K.E.C. to prove that substitutions are equal to specified items. **NYIKOS ASSOCIATES, INC.** as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. No substitutions shall be approved after bids are received.

1.15 DESIGN/MODEL CHANGE, DISCONTINUED ITEMS:

- A. All equipment specified shall be of latest design. Any improvements made in design and construction of prefabricated items before equipment is actually delivered to the project site, shall be incorporated in equipment, at no additional cost, provided such incorporation does not delay delivery date of equipment.
- B. In the event of an item being discontinued after specified and prior to delivery to project site, the K.E.C. shall be responsible for notifying the Consultant in writing of the discontinued item and request an alternate of equal performance, including all accessories, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for all moving parts. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. All guards shall provide easy access to the guarded parts.
- D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by the Consultant and the Owner in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional cost.
- E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. All gauges for sheet iron and sheet steel shall be U.S. Standard Gauges, and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<u>GAUGE</u>	<u>THICKNESS</u>	<u>GAUGE</u>	<u>THICKNESS</u>
#10	0.1406	#16	0.0625
#12	0.1094	#18	0.0500
#14	0.0781	#20	0.0375

- F. Materials or work described in words which have a well known and acceptable trade meaning shall be held to refer to such accepted meanings.

- G. Water Conserving Plumbing Fixtures: Provide water usage not to exceed, or to improve upon the following baselines for water conservation.
 - 1. Hand Washing Sink Faucets: 0.5 gallons per minute (gpm) at 60 psi
 - 2. Pre-rinse Spray Valves: 1.3 gallons per minute (gpm)
- H. Ice machine: ENERGY STAR labeled.
- I. Commercial Dishwashers: ENERGY STAR labeled.

2.2 MATERIALS:

A. Refrigeration Systems:

1. Self-contained:
 - a. Whether the units be top-mounted or cabinet-mounted, they shall be started by the K.E.C. and shall be tested for maintenance of temperature.
 - b. All units shall be furnished with condensate evaporators.
2. Remote: Provide and install complete refrigeration system(s), charged, started, and operating properly, according to the Item Specifications and the following.
 - a. Single stage compressors with air-cooled condensers operating within the recommended range of suction discharge pressure of economical operation and within the required capacity.
 - b. All units shall be new and factory assembled, to operate with the refrigerant specified. Refrigerant R-404 shall be used for all medium and low temperature applications. Due to the unsettled nature of refrigerants, no refrigerant shall be used with a phase-out date of less than ten (10) years from the date of installation.
 - c. Compressors shall be accessible hermetic type, Copeland or approved equal, and shall be equipped with high-low pressure control, liquid line drier, sight glass, suction and discharge vibration eliminator, and head pressure control.
 - d. The system shall have a factory mounted and pre-wired control panel complete with main fused disconnect, compressor circuit breakers, contactors, and time clocks wired for single point power connection.
 - e. The supporting frame shall be constructed of structural steel, fully welded, and protected against rust and corrosion with one (1) coat primer, and two (2) coats paint, unless otherwise specified.
 - f. Systems specified for outdoor installation shall be fully protected in a weather-proofed housing with louvered front panel and hinged top, constructed to resist rust and corrosion, and furnished with low ambient controls. Crankcase heater shall be provided with every compressor.
3. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the Board of Fire Underwriters or ASHRAE Standards, whichever is greater.
4. Each refrigeration item specification is written to provide minimum specifications and scope of work. All refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

<u>TYPE</u>	<u>REFRIGERATORS</u>	<u>FREEZERS</u>
a. Walk-In	+35° F./1.7° C.	-10° F./-23.3° C.
b. Reach-In	+35° F./1.7° C.	-10° F./-23.3° C.
c. Undercounter	+35° F./1.7° C.	-10° F./-23.3° C.
d. Fabricated	+35° F./1.7° C.	-10° F./-23.3° C.
e. Cold Pans	+0° F./-17.8° C.	
f. Work Rooms	+50° F./10° C.	

5. Provide (including payment if subcontracted) all electrical and refrigeration components needed by the completed system and complete (or have completed by the respective trades) all connections of and to said components.
 6. An evaporator coil defrost system shall be provided and installed by the K.E.C. on all refrigeration systems designed to operate at an evaporator coil temperature of less than +35° F. Evaporator coil units provided without electric defrost feature shall be installed with a solenoid valve in the liquid line, controlled by the time clock so as to shut off the flow of refrigerant and allow the compressor to pump down and shut off by activation of the pressure control switch.
 7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
 8. Verify and provide manufacturer's certification that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
 9. All refrigeration systems shall be installed and wired in strict conformance with the manufacturer's instructions and recommendations.
- B. Motors and Heating Elements:
1. Motors up to and including 1/2 HP shall be wired for 120 volt, single phase service. Motors larger than 1/2 HP shall be wired for 208 volt, single or three phase service as indicated. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Insulation shall be N.E.M.A. Class B or better.
 2. Heating elements having a connected load up to and including 1,000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the drawings.
 - a. Any heating element larger than 1,000 watts or any combination of elements in one fixture totaling more than 1,000 watts shall be wired for 208 volt single or three phase service, as indicated on the drawings.
 - b. Fixtures having multiple heating elements may be wired for three phase service with the load balanced as equally as possible within the fixture.
- C. Switches and Controls:
1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent graphics, conspicuously labeled, to assist the user of each item.
 2. Mount switches and controls directly adjacent the piece of equipment for which it involves, on operator's side of counter body apron, out of view to the public.
 3. Provide on or for each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating and in accordance with Underwriter's Code wherever such equipment is not built in. All other line switches, safety cut-outs, control panels, fuse boxes, other control fittings and connections, when not an integral part of the unit or furnished loose by the manufacturer will be furnished and installed by the Electrical Contractor, unless otherwise specified. All electrical controls, switches, or devices provided loose for field installation as a part of the item specified shall be installed in the field by the Contractor unless otherwise specified.

4. Appliances shall be furnished complete with motors, driving mechanisms, starters, and controllers, including master switches, timers, cut-outs, reversing mechanisms, and other electrical equipment if and as applicable.
- D. Cover Plates:
1. All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless steel cups, or mounted onto removable cover plates in such a fashion as to not protrude or interfere with the operation of each item.
 2. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches and controls furnished by the K.E.C., and shall match the material and finish of the equipment to which they will be fastened.
- E. Wiring and Conduit:
1. Wiring shall be properly protected in N.E.M.A. and U.L. approved metal enclosures. Only rigid steel conduit shall be used, zinc coated where unexposed and chrome plated where exposed. All wiring shall be run concealed wherever possible.
 2. All equipment furnished under this contract shall be so wired, wound, or constructed so as to conform with the electrical characteristics at the job site.
 3. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
 4. Furnish all foodservice equipment completely wired internally using wire and conduit suitable for a wet location. Where an Electrician's services are required, the work shall be done in the K.E.C.'s factory or at his expense at the job site at no additional cost to the Owner. Provide all electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a master circuit breaker panel with all wires neatly tagged showing item number, voltage characteristics, and load information. Final connection shall be made by the Electrical Contractor.
- F. Cords, Plugs, and Receptacles:
1. The Electrical Contractor shall provide three- or four-wire, grounding-type receptacles for all wall and floor mounted outlets to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment, as indicated on drawings and item specifications.
 2. K.E.C. shall coordinate with the Electrical Contractor so that the receptacles provided will match the specific plugs provided as part of the plug-in equipment. Any changes in cords and plugs required in the field due to lack of coordination between the Electrical Contractor and the K.E.C. shall be the latter's responsibility.
 3. Reduce the length of all cords furnished with the specified equipment to a suitable or appropriate length so they do not interfere with other equipment or operations.
 4. Pedestal receptacles that are part of fabricated equipment exposed to view, shall be similar to T&S Model No. B-1508DD single face, single gang or Model No. B-1528DD single face, double gang.
- G. Water Inlets:
1. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning. Where exposed to view, piping and fittings shall be chrome-plated.
- H. Drain Lines:
1. Plumbing Contractor shall provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes in accordance with Plumbing Rough-In

- Plans, chrome-plated where exposed. Extend to a point at least 1" (or as required by local codes) above the rim of the floor drain, cut bottom on 45° angle and secure in position.
2. All horizontal piping lines shall be run at the highest possible elevation and not less than 6" above finished floor, through equipment where possible.
 3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks of more than one thread at the fitting.
 4. All steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
 5. Provide suitable pressure regulating valves for all equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions.

I. Faucets, Valves and Fittings:

1. All sinks shall be fitted with chromium plated, swing spout faucets of same manufacturer throughout as follows, or otherwise specified in Item Specifications.
 - a. Prep and Utility Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-231.
 - b.) Fisher Manufacturing Company, Model 3253.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-221.
 - b.) Fisher Manufacturing Company, Model 3313.
 - b. Pot Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-290.
 - b.) Fisher Manufacturing Company, Model 5214.
2. Pre-Rinse Assemblies:
 - a. Splash-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-133 with B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2210 with 2902-12 wall bracket.
 - b. Deck-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-143 with B-510 mixing valve and B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2810 with 2805-CV mixing valve and 2902-12 wall bracket.
3. Vacuum Breakers:
 - a. General Use:
 - 1.) Fisher Manufacturing Company, Model 3990-8000.
 - b. Disposers:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-455.
 - b.) Fisher Manufacturing Company, Model 3990.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-456.
 - b.) Fisher Manufacturing Company, Model 3991.
4. Trough Inlets:
 - a. Fisher Manufacturing Company, Model No. 2905.
5. Other specialty faucets, pre-rinse assemblies, vacuum breakers, and trough inlets, as specified under Item Specifications.
6. All sink compartments shall be fitted with 2" NPT male, chrome-plated, brass rotary waste valves complete with overflow assemblies and stainless steel strainers.
 - a. Prep and General Utility Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6100.

- b. Pot Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6102.
 - 7. Refer to Division 22 for all other fittings.
- J. Metals and Alloys:
 - 1. Stainless steel sheets shall conform to ASTM 240, Type 302, Condition A, 18-8, of U.S. Standard Gauges as previously indicated under paragraph 2.1.E.
 - a. All exposed surfaces shall have a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view.
 - b. All sheets shall be uniform throughout in color, finish, and appearance.
 - c. Rolled shapes shall be of cold rolled type conforming to ASTM A36.
 - 2. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
 - 3. Where galvanized metal is specified, it shall be copper-bearing galvanized iron, cold-rolled, stretcher leveled, bonderized, re-rolled to insure a smooth surface, and used in the largest possible sizes with as few joints as necessary.
 - 4. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, and to sheets in conformance with ASTM A526, coating designation G-90.
- K. Castings:
 - 1. Castings shall consist of corrosion resisting metal (white metal) containing not less than 30% nickel. All castings shall be rough ground, polished, and buffed to bright lustre and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.
- L. Hardware and Casters:
 - 1. All hardware shall be of heavy duty type, satin finished chromium plated brass, cast or forged or highlighted stainless steel of uniform design. All hardware shall be a well known brand, and shall be identified by the manufacturer's name and model number for easy replacement of broken or worn parts.
 - 2. Casters on custom built equipment shall be heavy duty type, ball bearing, solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.
 - a. Solid material wheels are to be provided with stainless steel rotating wheel guard.
 - b. All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.
 - c. All equipment specified with casters shall have a minimum of two (2) with brakes installed on opposite corners, unless otherwise noted.
- M. Locks:
 - 1. When specified, doors and drawers of all custom fabricated or manufactured equipment shall be provided with cylinder locks, disc tumbler type with stainless steel faceplate as manufactured by Standard-Keil Mfg. Co., or approved equal.
 - a. Provide two (2) sets of keys for each lock.
 - b. All locks shall be keyed alike, except at cashiers stations or unless otherwise specified.
- N. Thermometers:
 - 1. All fabricated refrigerated compartments shall be fitted with exterior mounted, adjustable, dial or digital thermometers with flush bezels, and shall be calibrated after installation.
- O. Sealants:

1. Sealant, wherever required, shall conform to ASTM C 920; Type S Grade NS, Class 25, Use Nt, with characteristics that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 and N.S.F. RTV-732 for use in areas where it comes in contact with food.
2. Dow-Corning #780 or General Electric "Silastic", or approved equal, in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers recommendations for a smooth, sealed finish.

P. Plastic Laminate:

1. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect.
 - a. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1, 1/16" thick, satin finish, with rough sanded backs.
 - b. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical Surface), Grade HP, Class 1, non-forming, satin finish, 1/32" thick or heavier.
 - c. Curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish.
 - d. Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.
2. Adhesives:
 - a. For application of plastic laminate to wood substrates of horizontal surfaces shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C, producing a waterproof bond.
 - b. For applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C.
 - c. Contact adhesive will not be acceptable.

2.3 FABRICATION AND MANUFACTURE:

A. Materials and Workmanship:

1. Unless otherwise specified or shown on drawings, all materials shall be new, of best quality, perfect, and without flaws. Material shall be delivered and maintained on the job in an undamaged condition.
2. Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient, and skilled mechanics of the trades involved.
3. All items of standard equipment shall be the latest model at time of delivery.
4. All fabricated work shall be the product of one manufacturer of uniform design and finish.
5. Each fabricated item of equipment shall include all necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength.
6. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and all doors and drainboards shall be constructed of a single sheet of metal.
7. Except where required to be removable, all flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate all buckle, warp, rattle, and wobble. All equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the K.E.C. shall add additional bracing in an approved manner to achieve acceptance.

B. Sanitary Construction:

1. All fabricated equipment shall be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their Bulletin on Food Service Equipment entitled "Standard No. 2" dated October 1952, and in compliance with the local and State Public Health Regulations in which the installation will occur.
2. All fabricated equipment shall bear the N.S.F. "Seal of Approval".

C. Construction Methods:

1. Welding:

- a. All welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces; free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
- b. Spot welds shall have a maximum spacing of 3". Tack welds shall be of at least 1/4" length, and spaced no greater than 4" from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" centers.
- c. In no case shall soldering be considered as a replacement for welding, nor shall any soldering operation be done where dependence is placed on stability and strength of the joint.
- d. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building in one piece shall be constructed so that the field joints can be welded at the job site.
- e. All exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been sunk or depressed by welding operation, depression shall be suitably hammered and peened flush with the adjoining surface and ground to eliminate low spots. In all cases the grain of rough grinding shall be removed by successive fine polishing operations.
- f. All unexposed welded joints on undershelves of tables or counters of stainless steel shall be suitably coated at the factory with an approved metallic-based paint.
- g. After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with Military Specification Number MIL-P-26915.

2. Joints:

- a. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require a filler. Wherever break bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, all such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and shall be finished to obviate all danger of laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed edges occur.
- b. Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.

3. Bolt, Screw and Rivet Construction:

- a. All exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied.
- b. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel or chrome acorn nut and stainless steel lock washer.
- c. If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron rivets be used.

4. Sound Deadening:
 - a. Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel table tops, overshelves and undershelves.
 - b. Tighten stud bolts for maximum compression of sealant.
 5. Hi-Liting:
 - a. All horizontal edges of stainless steel tops, splashes, tops of raised rolled rims, and edges of all exposed doors, handles and shelf edges shall be hi-lited, in uniform design by grinding with abrasive not coarser than #240 grit, then polishing with compound to a uniform mirror finish.
 6. Polishing:
 - a. The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge.
 - b. Where sinks and adjacent drainboards are equipped with backsplash, the grain of the polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.
 7. Finishes:
 - a. Paint and coatings shall be of an N.S.F. approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations, and shall be applied in accordance with the manufacturers recommendations.
 - b. All exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, primed with rust inhibiting primer, de-greased, and finished with two (2) coats of glossy enamel grey hammertone paint, unless otherwise noted.
 - c. Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300° Fahrenheit.
 - d. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable after the equipment installation is complete at the job site, and final clean-up has begun.
- D. Construction:
1. Legs:
 - a. All tubular stands for open base tables, sinks, or dishtables shall have legs constructed of 1-5/8" O.D. stainless steel tubing, with 1-1/4" O.D., #16 gauge stainless steel crossbracing running between legs at a point 10" above finished floor.
 - b. All joints between legs and crossbracing shall be welded and ground smooth, full 360°.
 - c. The top end of legs shall be closely fitted into fully-enclosed stainless steel conical gussets no less than 3" high, similar to Klein #481-58 or #483-58, or approved equal.
 - d. Gussets shall be fully welded to framing reinforcing members, so that, set screw is not visible from front.
 - e. Legs without crossrails will not be accepted.
 - f. Legs shall be spaced at not more than 5'-6" on centers, unless otherwise specified.
 2. Feet:
 - a. All tubular legs will be swedged for appearance and close fit to United Show Case #BF-158, or approved equal, fully enclosed, stainless steel bullet-shaped foot.
 - 1.) The foot shall be threaded into a collar and completely welded inside the tubular leg to permit a maximum adjustment of 2" without any thread exposure.
 - 2.) Threads shall be National Course Series Class 2 fit or better, machined to prevent end play when foot is at maximum adjustment.

- 3.) The bullet-shaped foot shall have slightly rounded bottom to protect the floor, and a minimum bearing surface of 3/4" diameter of stainless steel-to-floor contact.
 - 4.) Bottom of tubular leg shall be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris.
- b. Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 3" in diameter at the top, United Show Case #CM-68B, or approved equal.
 - 1.) The bottom fully enclosed, stainless steel, bullet-shaped foot threads up into the inside of the upper member, with a male threaded 5/8" bushing to permit maximum adjustment of 2" without thread exposure.
 - 2.) The upper section shall be stamped in a neat design with a flared inverted shoulder and fully welded to a base plate designed for anchoring to the channel underbracing.
3. Table Tops:
 - a. Tables shall be constructed of stainless steel, and of a thickness not less than #14 gauge with 1-3/4" by 120° rolled edges, or as otherwise specified and detailed.
 - b. All corners shall be bull-nosed and of the same radius as rolled edges.
 - c. Joints where required shall be butt-welded and ground smooth to present a uniform one-piece appearance.
 - d. All tops shall be reinforced on the underside with a fully welded framework of 1-1/2"x1-1/2"x1/8" galvanized steel angles with the framing extending around the top perimeter and crossbraced on 24" maximum centers.
 - e. 1"x4"x1" galvanized or stainless steel, fully welded, cross channel, closed end members placed at each pair of legs with one (1) channel running lengthwise will also be acceptable.
 - f. All tops shall be reinforced so that there will be no noticeable deflection.
 - g. Metal tops where adjacent to walls or other items of equipment, shall be constructed with integral, coved, back and/or endsplashes as required and specified in accordance with the standard details contained herein. Close all ends of splashes.
4. Enclosed Bases:
 - a. All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each item.
 - b. Ends of body shall terminate at front or operator's side in a 2" wide mullion, vertical, and completely enclosed. All intermediate mullions shall be completely enclosed.
 - c. The bases shall be reinforced at the top with a framework of 1-1/2"x1-1/2"x1/8" galvanized angles, with all corners mitered and welded solid.
 - d. Underside of top shall be reinforced with channels and gussets where necessary. Additional angles and cross members shall be provided to reinforce shelves and support tops under heavy tabletop equipment.
 - e. Where sinks or other drop-in equipment occur, provide additional reinforcing extending crosswise, both sides of opening.
 - f. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, with the tops continuing to the wall line with integral, coved splashes as specified. Extend vertical face of body to the wall line only. This will permit adjustment to wall irregularities. Vertical trim strips will not be accepted.
 - g. Bodies shall be fitted with counter style stainless steel legs as hereinbefore specified.
5. Drawers:
 - a. Drawers, where specified, shall have removable pan inserts of #18 gauge stainless steel, and shall be approximately 20"x20"x5" deep unless otherwise specified.
 - 1.) Perimeter top edge shall be flanged out 1/2".

- 2.) All interior horizontal corners shall be rounded on a 1" radius, and all interior vertical corners shall be rounded on a 2" radius.
- b. Fronts shall be double pan #16 gauge stainless steel construction, 1" thick, insulated with a semi-rigid, fiberglass board, un-faced, having a three-pound density.
 - 1.) The top of the drawer face shall be formed as an integral pull by breaking the front pan back on a 45° angle 1", then straight up 1", back to front 1", and then down at the front 3/4".
 - 2.) Drawer front shall have all edges and corners ground smooth with a radius edge pull.
 - 3.) Provide hard rubber button bumpers attached to rear of drawer face at each corner.
- c. The drawer shall have an all welded frame of 1"x1", #16 gauge stainless steel angles sized to fit the removable pan insert.
- d. Drawers shall operate on #14 gauge full-extension slides with stainless steel roller bearings with hardened and ground raceways, Component Hardware, S52 Series, or approved equal. Slides shall be pitched approximately 3/8" per foot to permit self closing action.
- e. Drawers shall be adequately and neatly fitted to the guides to permit easy operation without rattle or binding.
- f. Slides and frame shall be reinforced to support a dead weight of 150 pounds when drawer is fully extended.
- g. Adjustable stops shall be provided for each drawer at the fully-opened position, and be readily liftable by hand for easy removal of drawer.
- h. All drawers not mounted inside a cabinet body shall be completely enclosed in an #18 gauge stainless steel box-type enclosure and suspended from angle framing under the fixture top. The housing bottom shall be flanged and welded to an #18 gauge stainless steel reinforcing channel extending across the open end.
6. Sliding Doors:
 - a. Sliding doors shall be of the double pan type, with the exterior pan constructed of #18 gauge stainless steel with all four sides channeled and corners welded. The interior pan shall be similarly constructed of #20 gauge stainless steel, set into the exterior pan, and welded in place.
 - b. All doors shall be insulated with semi-rigid fiberglass board, un-faced, having a three-pound density. Styrofoam shall not be acceptable.
 - c. Doors 18" wide or greater, shall have internally welded 4" wide reinforcing channels to prevent warpage.
 - d. Each door shall be fitted with a positive flush-type stainless steel pull, Standard-Kiel #1262-1014-1283 recessed handle, or approved equal.
 - e. In the back of each door install a 1"x1", #16 gauge stainless steel angle stop welded in a suitable location to prevent the doors from overpassing the flush pulls.
 - f. Doors in the closed position shall overlap each other by no more than 2".
 - g. Each door shall be fitted with two (2), 1-3/8" ball bearing sheaves fastened to 1"x1/8" stainless steel bar stock welded to the top corners of each door for suspending on an overhead #16 gauge stainless steel channel track. The hangers shall be tapped for 1/4"-20 thumb screw vertical locks which prevent the doors from jumping the track in operation while permitting easy removal for cleaning without tools.
 - h. Insure that the bottom of the doors are positively and continuously guided to assure proper alignment and passing regardless of the position of each door.
 - i. Provide hard rubber bumpers for doors to close against to insure quiet operation.
7. Hinged Doors:
 - a. Hinged doors shall be of the same materials and construction as sliding doors previously specified.

- b. Hinges shall be heavy duty, stainless steel, removable type, and fastened by tapping into 1/4"x3/4" stainless steel bar stock inside the door pan and behind the door jamb.
 - c. The door face shall be flush with the cabinet body when fully closed.
 - d. Size widths of doors equally when installed in pairs, or in series with other pairs, with no door being greater than 36" in width.
 - e. Doors shall be held closed by permanent magnetic closure devices of an approved type and of sufficient strength to hold the doors shut. Install two (2) per door (minimum), mounted to the door jamb, top and bottom, with opposing chrome-plated steel plates securely fastened to the inner panel of the doors.
8. Undershelves:
- a. All open base tables shall be provided with full-length undershelves of #16 gauge stainless steel fully welded to legs with all joints ground smooth and polished.
 - b. Front edge shall turn down 1-1/2" and under 1/2".
 - c. Turn up rear and ends 2", with integral coved radius, when specified.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" galvanized angle bracing mounted to underside, full length.
9. Interior Shelves:
- a. All interior shelves within cabinet bodies, enclosed bases and overhead cabinets, shall be of #16 gauge stainless steel.
 - b. Removable shelves shall be constructed in equal sections, and rest in 1-1/2"x1-1/2"x1/8" stainless steel angle frame. Cove all horizontal corners in accordance with N.S.F. requirements.
 - c. Stationary shelves shall have 2" turn-up on back and ends, and continuously welded to cabinet body, polished and ground smooth to form a one-piece interior free of any crevices.
 - d. Front edge shall turn down 1-1/2" and under 1/2", and finished with "z" bar forming completely enclosed edge for maximum strength and sanitation.
 - e. Provide 1-1/2"x1-1/2"x1/8" angle bracing mounted to underside, full length.
10. Elevated Shelves:
- a. Shelves over equipment not adjacent to a wall shall be mounted on 1" diameter #16 gauge stainless steel tubular standards neatly fitted with stainless steel base flanges, unless otherwise specified.
 - b. The top of the tubular standards shall be completely welded to #14 gauge stainless steel support channels, full width of overshef.
 - c. Inside the tubular standard, and welded to same, provide 1/2" diameter steel tension rod extended through countertop and securely anchored to lower framework reinforcing with nuts and lock washers in such a manner as to assure a stable, sway-free structure.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" stainless steel angle bracing mounted to underside, full length.
 - e. Cantilevered shelves, when called for, shall be #16 gauge stainless steel supported on #14 gauge stainless steel brackets welded to 1-5/8" O.D. stainless steel tubular standards extending through the backsplash, and fully welded to the table framework. Provide Klein #481-SH welded sleeves where standards penetrate backsplash.
11. Wall Shelves:
- a. Open wall shelves shall be constructed of #16 gauge stainless steel with back and ends turned up 2", positioned 2" out from face of wall, with all corners welded, and supported on #14 gauge stainless steel brackets.
 - b. Brackets shall be flanged inward beneath the shelf and at the wall 1-1/2" with intersecting flanges completely welded, and attached to shelf with studs welded to the underside and bolted with stainless steel lock washers and chrome-plated cap nuts.

- c. Each bracket shall be fastened to the wall with a minimum of two (2) 1/4"-20 stainless steel bolts anchored securely by means of toggles or expansion shields.
12. Sinks:
- a. All sinks shall be the size and shape as shown on drawings, and constructed of #14 gauge stainless steel with backs, bottoms and fronts formed of one continuous sheet and the ends welded in place.
 - b. Sinks shall have all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
 - c. Multiple compartment sinks shall be divided with double wall, #14 gauge stainless steel partitions with a 1/2" radius on top and all corners rounded as other corners, continuously welded, ground smooth and polished.
 - d. The bottom of each compartment shall be creased to a die stamped recess, tapered and shaped to receive a lever type waste without the use of solder, rivets, or welding.
 - e. Provide #14 gauge stainless steel waste lever angle bracket mounted to underside of compartment at front.
 - f. The front and exposed ends of sinks shall be fabricated with a 1-1/2", 180° rolled edge. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
 - g. Unless otherwise specified, two (2) faucet holes on 8" centers shall be provided, located over the center line of partitions between compartments, 2-1/2" down from splash break.
 - h. Gussets for legs shall be fully welded all around to #12 gauge stainless steel triangular plates fully welded to underside of sink.
 - i. Sinks fabricated into working surfaces shall be constructed of the same material and in like manner to sinks specified above, except rolled edge and backsplash shall be omitted and the bowl shall be completely welded integral and flush with the working surface. Where basket type wastes are called for, they shall be fitted with removable seats.
 - j. Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.
13. Sink Drainboards:
- a. Drainboards shall be constructed of the same material as the sinks and shall be welded integral to same.
 - b. The front portion of drainboards shall continue the 1-1/2", 180° rolled edge of sink bowls on a continuous and level horizontal plane.
 - c. The surface of the drainboard shall pitch from 2-1/2" at the end furthest from the sink, to 3" at the bowl; or 1/8" per foot. In addition, the bottom surface shall be dished toward the center for complete drainage.
 - d. The backsplash of the drainboard shall match the rear of the sink contour and shall be welded integral thereto, running parallel to the floor.
 - e. Drainboards shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise.
 - f. Where disposer cones are fabricated into drainboards, additional 1"x4"x1" stainless steel channels shall be welded into the top framing, spanning the drainboard from front-to-back on both sides of the cone and located not more than 3" to either side.
 - g. Disposer control panels or switches shall be supported beneath drainboards, when specified, by means of a #12 gauge stainless steel mounting bracket.
14. Dishtable Tops:
- a. Dishtables shall be constructed of #14 gauge stainless steel with all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.

- b. Fronts and exposed ends shall be fabricated with a 3" high, 1-1/2", 180° rolled edge with rounded corners. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
 - c. All tops shall slope 1/8" per foot (minimum).
 - d. Dishtables shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise fully welded between front-to-back channels.
 - e. Where tops fit into dishmachines, they shall turn down and into, forming a sealed watertight fit, and attached according to dishmachine manufacturers instructions.
 - f. On each side of dishmachine, tables shall be provided with integral splash shields as part of the backsplash.
 - g. Silicon filling of gaps caused by poor fit will not be acceptable.
 - h. On corner-type door machines, provide #14 gauge stainless steel wall-mounted, splash panel to protect adjacent wall, full width of door opening.
15. Cafeteria Style Counters:
- a. All counters shall be constructed as previously specified under Enclosed Bases.
 - b. Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, etc., whether a drop-in unit or a cutout for a portable unit.
 - c. Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counteredge.
 - d. The countertop shall be constructed of #14 gauge stainless steel, as previously specified, with all joints welded, ground and polished.
 - e. Fronts and exposed ends shall be stainless steel, plastic laminate or other material as noted in the Item Specifications.
 - f. All display glass shelving shall be 1/4" polished plate glass and fully trimmed with #18 gauge stainless steel formed channels. Top shelves shall be the same width as the shelf below. Shelves shall be supported on 5/8" square, #16 gauge stainless steel perimeter tubing fully welded to 1-1/4" square, #16 gauge stainless steel tubing uprights.
 - g. Provide appropriate adjustable glass sneeze or breath guards trimmed in stainless steel along front, entire length, mounted in Klein 4465-A brackets.
 - h. Protector shelf over hot food wells shall be #16 gauge stainless steel supported on 1-1/4" square, #16 gauge stainless steel tubing uprights, with 1/4" polished plate glass front and end panels trimmed in #18 gauge stainless steel channels. When specified for self-service, mount bottom edge of front panel 8" above countertop.
 - i. All display and protector shelves shall be furnished with full-length fluorescent lights wired to on/off switch in counter apron, with lamps and protective shields. Conceal all wiring in tubular uprights.
 - j. Refer to Item Specification for changes, as required.
 - k. Counter shall be internally wired complete by the K.E.C., and in such a way as to meet the requirements of the Electrical Code of the job location.

2.4 EQUIPMENT:

- A. All items listed on the Contract Documents under the heading "Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed Itemized Specifications.

- B. Manufacturer's names and model numbers are shown establishing quality, size, and finish required, representing the Owner's and Consultant's requirements and basis for bid. Equipment is listed hereinafter with same item numbers as shown on Contract Documents.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Before beginning the installation of foodservice equipment, the spaces and existing conditions shall be examined by the K.E.C. and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect in writing.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.
 - 2. Beginning installation shall constitute acceptance of the area.

3.2 PREPARATION:

- A. Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.
- B. Field verify all measurements at the building prior to fabrication of custom equipment. Coordinate measurements and dimensions with rough-in and space requirements.

3.3 INSTALLATION:

- A. The K.E.C. shall coordinate his delivery schedule with the Contractor to ensure adequate openings in the building to receive the equipment.
- B. Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.
- C. Provide a competent, experienced foreman to supervise installation and final connections with other trades.
- D. Remote Refrigeration Systems:
 - 1. All refrigeration work where applicable to this contract shall be accomplished in an approved manner, using finest quality fittings, controls, valves, etc.
 - 2. Refrigeration items shall be started up, tested, adjusted, and turned over to the Owner in first class condition and left running in accordance with the manufacturer's instructions.
 - 3. Refrigeration lines and hook-ups shall be completed by the K.E.C. with the exception of electric, water, and drain line final connections unless otherwise specified.
 - 4. All copper tubing shall be refrigerant grade A.C.R. or type "L".
 - 5. Silver solder and/or Sole-Phase shall be used for all refrigerant piping. Soft solder is not acceptable.
 - 6. All refrigerant lines in pipe sleeves or conduit shall be effectively caulked at ends to prevent entrance of water or vermin and at penetrations through walls or floors.
 - 7. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers at 6'-0" o.c. maximum.

8. Wrap drain line in freezer compartment(s) with approved heat-tape for final connection by Electrical Contractor.
- E. Sealing and Caulking:
1. Prior to the application of sealant, all surfaces shall be thoroughly cleaned and degreased.
 2. Apply around each unit of permanent installation at all intersections with walls, floors, curbs or other permanent items of equipment.
 3. Joints shall be air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes.
 4. In general, joints shall be not less than 1/8" wide, with backer rod to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
 5. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" radius.
 6. Provide sealant-filled joints up to 3/4" in joint width. Trim strips for wider joints shall be set in a bed of sealant and attached with stainless steel fasteners, 48" o.c., or less, to insure suitable fastening and prevent buckling of the metals fastened.
- F. Cutting:
1. All cutting, fitting, or patching required during installation shall be accomplished by the K.E.C., at his own expense, so as to make the work conform to the plans and specifications.
 2. The K.E.C. shall not cut or otherwise alter, except with the consent of the Owner, the work of any other Contractor.
 3. Provide cut-outs in foodservice equipment where required to run plumbing, electric, or steam lines through equipment items for final connections.

3.4 FIELD QUALITY CONTROL:

- A. Inspection:
1. Provide access to shop fabrication areas during normal working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative.
 2. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications, and approved drawings.
- B. Start-Up and Testing:
1. Delay start-up of foodservice equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
 2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
 3. Supply a trained person or persons who shall start up all equipment, test and make adjustments as necessary, resulting in each item of equipment, including controls and safety devices, performing in accordance with the manufacturer's specifications.
 4. All gas-fired equipment shall be checked by the local gas company as to calibration, air adjustments, etc., and adjustments made as required.
 5. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.
- C. Demonstration:
1. Provide an operating demonstration of all equipment at a time of Owner's convenience, to be held in the presence of authorized representatives of the Architect and Owner.

2. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.
3. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.
4. Furnish complete, bound, operation/maintenance manuals and certificates of warranty for all items of equipment provided, in accordance with Article 1.5 Submittals, Paragraph F, at this demonstration time.

3.5 ADJUST AND CLEAN:

- A. Upon completion of installation and tests, clean and sanitize foodservice equipment, and leave in condition ready for use in food service.
- B. Remove all protective coverings, and thoroughly clean equipment both internally and externally.
- C. Make and check final adjustments required for proper operation of the equipment.
- D. Restore finishes marred during installation to remove abrasions, dents, and other damages. Polish stainless steel surfaces, and touch-up painted surfaces with original paint.
- E. Clean up all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and put the site in a neat, orderly, and broom-clean condition.

3.6 EQUIPMENT SCHEDULE:

ITEM #1: FLY FAN -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL DIVISION)

QUANTITY: One (1)

ITEM #2: UTILITY CART, MOBILE

QUANTITY: Three (3)
 MANUFACTURER: Steril-Sil Company
 MODEL NO.: UTC-302 (N058)
 PERTINENT DATA: Heavy-Duty, Stainless Steel, 1,000-lb. Capacity, Two-Shelf, NSF Model
 UTILITIES REQ'D: ----
 ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Fixed front casters, swivel and locking rear casters and bumpers.

ITEM #3: WALK-IN COOLER/FREEZER

QUANTITY: One (1)
 MANUFACTURER: Thermo-Kool
 MODEL NO.: Indoor Installation (N058)
 PERTINENT DATA: 4" Thick Durathane Construction - Class I; NSF Construction
 UTILITIES REQ'D: 1750W, 120V, 1PH; (2) 3/4" IW
 ALTERNATE MFRS.: Kolpak; Bally

ITEM #3: (Continued)

Furnish and install per Equipment Plan, Sheet K-101, Manufacturer's Shop Drawing and the following:

1. Two Section Unit: 22'-2" L x 13'-6" D x 8'-6" H. Interior width: Cooler - 11'-1", Freezer - 10'-1".
2. Exterior Finish:
 - 26 GA stucco embossed galvanized steel where unexposed.
 - 20 GA stucco embossed stainless steel where exposed.
3. Interior Finish:
 - White acrylic enamel baked-on .040 stucco embossed aluminum walls.
 - White acrylic enamel baked on 26 GA smooth galvanized steel ceiling.
4. Interior Floor:
 - 4" prefabricated floor panels installed in 6" deep floor recess over hot asphalt paper or 10 MIL polyethylene sheets on building floor slab.
 - 2" setting bed with two (2) layers of wire reinforcing mesh fabric with poured resinous floor applied with 6" high integral coved base, interior and exterior of box, installed over prefabricated floor panel by Flooring Contractor.
5. Entrance Door:
 - Two (2) flush-mounted, left-hand hinged self-closing doors, with 34" x 76" net opening.
 - Polished chrome camlift hinges with lift off capability. One (1) extra hinge per door, three (3) total.
 - Kason #1236 polished chrome lever-action handle with knob turn release and cylinder lock.
 - Hydraulic door closer.
 - Standard 2" diameter dial indicating thermometer factory mounted, each compartment.
 - 36" high aluminum diamond tread kickplates, interior and exterior of door, frame and jamb.
 - 14" x 24" heated observation windows, both compartments.
 - Foot treadle door opener.
 - Kason #1806 LED light fixture with high-impact plastic cover centered over door opening to avoid conflict with shelving, each compartment. Extend wiring in conduit, foamed within door panel header, to junction box mounted on top of walk-in ceiling, each compartment.
 - Undercut doors for 6" floor depression. See Sheet K-102 for details.
 - Kason #907 interior door handle, factory mounted, with concealed metal backing plate.
 - Round vinyl door bumper mounted to front exterior face to protect handle from puncturing wall when door in full open position.
 - Engraved phenolic plastic compartment sign - 12" long x 2" high; white in color with 1" high blue CAPITAL letters mounted on each door above observation window; (1) - COOLER, (1) - FREEZER.
 - 12-gauge heavy-duty stainless steel heated threshold, each compartment.
 - Foamed-in-place concealed locking bar. Locking bar to include provisions for a padlock.
6. Heated pressure relief port in freezer.
7. Four (4) Kason #1810L21248LB 48" long LED light fixtures with shatter-proof high impact plastic covers centrally-mounted to walk-in ceiling per Detail, Sheet K-104; two (2) for the cooler, two (2) for the freezer. Extend conduit connection up thru top. Fixtures shipped loose and mounted by K.E.C.; final connection by Electrical Contractor. K.E.C. to seal and insulate with silicone sealant all knock-outs in fixture casing to prevent moisture infiltration.

ITEM #3: (Continued)

8. One (1) #TK4700 walk-in monitor system with #TK4 light control and panic button factory mounted in each door panel and inter-wired with building monitoring system, as required by Electrical Contractor. Provide engraved identification label mounted above the alarm.
9. Provide and install trim strips of matching exterior finish between ends of walk-in panels and building walls from finish floor to 6" above finish ceiling; verify finished ceiling height.
10. Provide and install closure panels of matching exterior finish between top of walk-in and finish ceiling; verify finished ceiling height.
11. All electrical conduit shall be run concealed above walk-in ceiling, per Detail Sheet K-104.
12. Evaporator coil drain lines shall be run to floor drain with "P"-trap on exterior of box by K.E.C. Pitch drain lines 1" per foot of horizontal run.
13. Black flexible "Armaflex" insulation applied to exposed drain lines and fittings within interior of box by K.E.C.
14. Spiral heat tape applied to drain line within interior of freezer compartment prior to application of insulation by K.E.C.
15. Coordinate location of sprinkler head drops and provide penetrations, where necessary.
16. K.E.C. to seal and insulate all openings to prevent infiltration of warm air into cooler/freezer compartments.
17. Accessories:
 - One (1) Kolpak #HAL-C2-N1 air shield mounted vertically on the hinge side of doorjamb inside each walk-in compartment. Electrical Contractor to provide power receptacle and final connection.
 - #16 ga. stainless steel hat-channel bumper rail with closed ends installed to front face of walk-in, full-length, mounted @ 36" A.F.F. Provide 1/8" diamond tread kickplates from top of finish floor coved base to bottom of bumper rail.
 - 6" high 1/8" thick aluminum cove baseboard, to be installed where panels are exposed at kitchen side, fastened with countersink screws and seal with gray-color silicone sealant to finish floor and walk-in panels.
18. Quality Inspection Requirement:
 - Walk-In shall be completely erected at the manufacturer's facility prior to shipment and a quality control inspection performed on the assembled structure. A digital photograph of the assembled walk-in shall be provided for the K.E.C. permanent records and included in the operation and maintenance manuals.

ITEM #4: COOLER REFRIGERATION SYSTEM

QUANTITY:	One (1)
MANUFACTURER:	ColdZone
MODEL NO.:	CFO150E4S-E (N058)
PERTINENT DATA:	Uni-Pak, Air-Cooled, Outdoor Installation, With EcoNet® Intelligent Control
UTILITIES REQ'D:	10.3A, 208V, 3PH
ALTERNATE MFRS.:	RDT; Omni-Temp

ITEM #4: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-102; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, Medium Temperature, R-448A.
2. System located outdoors on roof. Curb with pitch-pocket furnished and installed by Contractor. Refer to Architectural Roof Plan, Sheet A1.13 for exact location.
3. Complete winterization package and condensing unit weatherproof cover.
4. Overall size: 28.25" L x 40" W x 19" H.
5. Weight: 205 lbs.
6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6A117SDARE; 1.6A, 120V, 1PH
 - System to operate at +35°F.
 - Furnished complete with thermostat, solenoid and expansion valves factory mounted ready for final connection by Refrigeration Contractor.
 - EcoNet® Intelligent Control with remote monitoring and diagnostics.
 - Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.
7. Unit factory pre-wired to main-fused disconnect switch.
8. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.

ITEM #5: FREEZER REFRIGERATION SYSTEM

QUANTITY:	One (1)
MANUFACTURER:	ColdZone
MODEL NO.:	CFO400L4S-E (N058)
PERTINENT DATA:	Uni-Pak, Air-Cooled, Outdoor Installation, With EcoNet® Intelligent Control
UTILITIES REQ'D:	15.0A, 208V, 3PH
ALTERNATE MFRS.:	RDT; Omni-Temp

Furnish and set-in-place per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-102; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, Low Temperature, R-448A.
2. System located outdoors on roof. Curb with pitch-pocket furnished and installed by Contractor. Refer to Architectural Roof Plan, Sheet A1.13 for exact location.
3. Complete winterization package and condensing unit weatherproof cover.
4. Overall size: 33" L x 44" W x 35" H.
5. Weight: 352 lbs.

ITEM #5: (Continued)

6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6E121DDARE, 1.5A, 208V, 1PH (Fan); 14.3A, 208V, 1PH (Defrost Heater)
 - System to operate at -10°F.
 - Furnished complete with thermostat, solenoid and expansion valves factory mounted ready for final connection by Refrigeration Contractor.
 - EcoNet® Intelligent Control with remote monitoring and diagnostics.
 - Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.
7. Unit factory pre-wired to main-fused disconnect switch.
8. Factory certified installers to provide complete refrigeration system warrantee: five (5) years for the compressor, two (2) years for the condensing unit, and two (2) years for all parts of the evaporator coil.

ITEM #6: DUNNAGE RACK, MOBILE

QUANTITY: Four (4)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: With Wire Mat, Metroseal 3™
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

Cooler:

1. One (1) #MHP33K3 Metroseal 3™ unit; 18" W x 36" L.

Freezer:

1. One (1) #MHP33K3 Metroseal 3™ unit; 18" W x 36" L.

Dry Storage:

1. Two (2) #MHP33K3 Metroseal 3™ units; 18" W x 36" L.

ITEM #7: SHELVING, MOBILE

QUANTITY: Seventeen (17)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax i (N058)
PERTINENT DATA: Four-Tier High, 18" Wide, Open-Grid Shelf Mat, Polymer
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

ITEM #7: (Continued)

Cooler:

1. Three (3) #MX1836G sections; 18" W x 36" L x 4-tier high.
2. Five (5) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Thirty-two (32) #MX63UP polymer posts for stem casters, 61-3/16" high.
4. Sixteen (16) #5MPX polyurethane swivel casters with bumpers.
5. Sixteen (16) #5MPBX polyurethane swivel casters with brakes and bumpers.
6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

Freezer:

1. Two (2) #MX1836G sections; 18" W x 36" L x 4-tier high.
2. Seven (7) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Thirty-six (36) #MX63UP polymer posts for stem casters, 61-3/16" high.
4. Eighteen (18) #5MPX polyurethane swivel casters with bumpers.
5. Eighteen (18) #5MPBX polyurethane swivel casters with brakes and bumpers.
6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #8: SHELVING, MOBILE

QUANTITY:	Seven (7)
MANUFACTURER:	InterMetro Industries Corporation
MODEL NO.:	MetroMax Q (N058)
PERTINENT DATA:	Free-Standing, Polymer Mats, Epoxy Coated Frames & Posts
UTILITIES REQ'D:	----
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

Dry Storage:

1. Four (4) #MQ1836G sections; 18" W x 36" L x 5-tier high.
2. Three (3) #MQ1848G sections; 18" W x 48" L x 5-tier high.
3. Twenty-eight (28) #MQ74UPE polymer posts, 73-3/16" high.

ITEM #8: (Continued)

4. Fourteen (14) #5MPX polyurethane swivel casters with bumpers.
5. Fourteen (14) #5MPBX polyurethane swivel casters with brakes and bumpers.
6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #9: HAND SINK

QUANTITY:	Five (5)
MANUFACTURER:	Eagle Foodservice Equipment Company
MODEL NO.:	HSA-10-FAW-LRS (N058)
PERTINENT DATA:	Wall Mounted Assembly, With Wrist-Action Handles
UTILITIES REQ'D:	1/2" HW, 1/2" CW, 1-1/2" W
ALTERNATE MFRS.:	Advance/Tabco

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Complete sink assembly including faucet, P-trap, tailpiece, strainer and wall mounting bracket.
2. Accessories: (each unit)
 - #606215 stainless steel skirt assembly.
 - Left and right end splashes.

ITEM #10: SOAP & TOWEL DISPENSER - - (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY:	Five (5)
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ITEM #11: PREP SINK

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO:	#14 GA Stainless Steel
PERTINENT DATA:	7'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D:	1/2" HW, 1/2" CW, (2) 1-1/2" IW
ALTERNATE MFRS	None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front and end edge rolls per Detail 1.02B.
2. 13" high back splash per Detail 1.04A. Attach backsplash to wall with fabricator-supplied z-clips.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.

ITEM #11: (Continued)

5. Stainless steel undershelf on both ends per Detail 1.11.
6. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
7. Accessories:
 - One (1) T&S #B-0231 backsplash-mounted swing spout faucet with #B-0199-01F-10 aerator.
 - Two (2) T&S #B-3950-01 twist waste valves with overflow assemblies and #010387-45 basket strainers.
8. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades.

ITEM #12: WORKTABLE

QUANTITY:	Two (2)
MANUFACTURER:	Custom Fabricated
MODEL NO.:	#14 GA Stainless Steel
PERTINENT DATA:	6'-6" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D:	----
ALTERNATE MFR:	None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07.
4. Stainless steel undershelf per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of worktable with NSF-approved sound dampening material.
8. Accessories:
 - One (1) Edlund #S-11C manual can opener installed on the Worktable to the left of Item #11, Prep Sink.

ITEM #13: WORKTABLE WITH SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 7'-6" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07. Flanged feet on each corner leg.
4. Stainless steel undershelf per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Full-length table-mounted, dual-sided utensil rack with twenty (20) double-sided sliding stainless steel pot hooks per Detail 1.18B.
7. Worktable per Detail 2.01.
8. 18" x 18" x 10" deep utility sink per Detail 3.04 with stainless steel waste lever angle bracket fully welded to underside of sink.
9. Sound-deaden underside of tabletop and sink with NSF-approved sound dampening material.
10. Accessories:
 - One (1) T&S #B-0325 deck-mounted swing spout faucet with #B-199-2 aerator.
 - One (1) T&S #B-3950-01 twist waste valve with overflow assembly and #010387-45 basket strainer.

ITEM #14: RETRACTABLE CORD REEL

QUANTITY: Six (6)
MANUFACTURER: APC Group Inc.
MODEL NO.: Kitchen Leash #KL-152012-D (N058)
PERTINENT DATA: Ceiling-Mounted, With Adjustable Stop, Non-GFI Receptacle
UTILITIES REQ'D: 20.0A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and install per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Electrical Contractor to furnish and install GFCI type breaker at kitchen electrical panel board.

ITEM #15: UTILITY RACEWAY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO.: UDW (N058)
PERTINENT DATA: Wall-Mounted
UTILITIES REQ'D: 40.0A, 120/208V, 3PH; 225.0A, 480V, 3PH; 3/4"HW, 1"CW
ALTERNATE MFRS.: Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K-101; Utility Raceway Details, Sheet K-502; Manufacturer's Shop Drawing and the following:

1. All components and labor necessary for a complete system manufactured in accordance with NEC latest edition, NEMA, NFPA No. 96 and No. 54, Uniform Plumbing Code, ASME, OSHA using only U.L. Listed certified components.
2. One (1) 14'-4" long, 12" wide x 6'-10" high with risers, completely pre-wired and pre-plumbed to one final connection point for electric, hot water and cold water. All connections shall face down on horizontal member.
3. System shall extend up to bottom edge of Ventilator, Item #16.
4. 54" overall height less risers with peaked top.
5. Risers on each end with 2" penetration into ventilator at 6'-8" A.F.F.
6. Entire raceway shall be constructed of #16-gauge Type 304 stainless steel with a #4 mill finish.
7. Removable link plates constructed of #16-gauge stainless steel.
8. Electrical compartment shall be completely enclosed with stainless steel housing accessible by the removal of link plates. Internal electrical feeder shall be cable busbar having balanced load and phases and with connection lugs for main service. Branch circuit wiring for each electrical connection shall be phase identified and sized in accordance with circuit breaker rated capacity. Raceway shall provide electrical and water service for items #17, #18, #19, and #20.
9. Provide 12" long interchangeable 16-gauge stainless steel link connection plate for each electrical connection wired to electrical load center in riser end with individual circuit breaker(s) and grounding type receptacle with twist-lock feature or pre-wired flexible sealtite conduit.
10. On each connection plate provide U.L. listed GFIC ground fault interrupter circuits and matching power supply cords on each 120-volt single-phase connection.
11. Hot water and cold water plumbing compartment shall be isolated from electrical compartment. All piping and disconnects in system shall be color coded.
12. Provide fire/fuel shut-off for electric equipment per NFPA No. 96. System shall require one final connection by Contractor from fire protection system.
13. All hot and cold water piping, including individual branch pipe connection, shall be hard temper type "L" copper tubing with copper sweat type solder fittings. At each individual connection, provide A.G.A approved flexible hose(s) with two wall brass and stainless steel construction with quick-disconnect fittings.

ITEM #15: (Continued)

14. Provide matching cord sets for all electric equipment, seven (7) total.
15. Neoprene bumper strips, full length.
16. U.L. listed, solid-state control panel mounted in right-hand riser end, with the following integral accessories:
 - Ventilator start/stop station with adjustable time-delay to exhaust residual heat.
 - Ventilator light switch, pre-wired in 10ft. flexible conduit ready for connection to light junction box in ventilator by Electrical Contractor.
17. Accessories:
 - Two (2) Everpure #EV9797-22 Kleen-Steam II twin water filter systems factory-installed and housed within left-hand riser. Provide two (2) independent pre-piped water lines to service points for Item #17: Convection Steamer and Item #19: Combi Oven. Fabricate 18"x18" lexan viewport in riser panel to monitor pressure gauge and filter bowl.
 - Watts #LF7R dual check valve for each water drop.
18. Fabricated in three (3) sections, assembled in field to present integral one-piece appearance.
19. Main electrical shunt-type circuit breakers mounted in right-hand riser for 40.0A, 120/208V, 3PH and 225.0A, 480V, 3PH services.
20. Factory System Design Verification (SDV) shall be performed after all inspections are complete. SDV report shall be available once completed.
21. Raceway shall be of same manufacturer as Ventilator, Item #16.

ITEM #16: EXHAUST CANOPY

QUANTITY:	One (1)
MANUFACTURER:	Captive-Aire Systems, Inc.
MODEL NO.:	7230VHB-G-PSP-F-ND (N058)
PERTINENT DATA:	Wall-Mounted, Perforated Ceiling Make-up Air Plenum, Stainless Steel, Non-Grease, Heat/Vapor Removal Only Type
UTILITIES REQ'D:	2,000 CFM Exhaust/1,600 CFM Supply, 800W, 120V, 1PH (Lights)
ALTERNATE MFRS.:	Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K-101; Ventilator Detail Drawing, Sheet K-503; Manufacturer's Shop Drawing and the following:

1. 6'-0" Wide x 13'-4" Long x 2'-6" High, with bottom edge mounted at 6'-8" A.F.F. Length comprised of one (1) 7'-6" long section on the left side and one (1) 5'-10" long section on the right side. Entire unit constructed of 18 GA, type 304 stainless steel #4 mill finish with liquid tight all welded external continuous seams and joints per N.F.P.A. 96, U.L. and State of Maryland Codes.
2. Nine (9) U.L. Listed, NSF-Approved, recessed Allanson round LED fixtures and LED lights, five (5) on the left and four (4) on the right side, equally spaced.
3. Matching stainless steel perimeter closure panels to finished ceiling by K.E.C.; verify ceiling height.

ITEM #16: (Continued)

4. Hanger rods and support system from structure above by other contract. K.E.C. to coordinate method and location with other trades.
5. Integral stainless steel hanger brackets.
6. 1" wide full-perimeter integral gutter with 1" turn-up and 3/4" stainless steel drain connection.
7. Full-length, front-mounted perforated stainless steel ceiling-mounted make-up air plenum with integral supply air balancing dampers for each hood section.
8. Integral 12" wide space at rear of Ventilator to accommodate Utility Raceway, Item #15.
9. Factory supervision of installation and start-up.
10. Accessories:
 - Field wrapper.
 - #18-gauge stainless steel wall flashing full length of hood to extend from top of finish floor coved base up to bottom edge of hood body. Attach to wall with non-exposed fasteners and seal with clear silicone sealant.
 - 12" utility riser at right end with U.L. listed electrical pre-wire package #SC-31111000 with light and fan switches. Extend utility riser closure panel to finished ceiling.
11. Ventilator shall be of same manufacturer as Utility Raceway, Item #15.

ITEM #17: CONVECTION STEAMER, MOBILE

QUANTITY: One (1)
MANUFACTURER: AccuTemp Products, Inc.
MODEL NO.: E64803E140 DBL (N058)
PERTINENT DATA: (2) Double Stacked, Stand-Mounted 6-Pan, Connected Boilerless, Evolution Series
UTILITIES REQ'D: (2) 17.0A, 480V, 3PH; (2) 3/4" CW, (2) 3/4" IW
ALTERNATE MFRS.: Cleveland

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories:
 - #SNH-21-01 heavy-duty stainless steel support stand with 5" casters.
 - Dormont Safety-Set equipment placement system.
 - One (1) Everpure #EV9797-22 KleenSteam II Twin System Water Filter. Ship to Utility Raceway manufacturer for factory installation.
2. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #18: TILTING KETTLE, 20-GALLON

QUANTITY: One (1)
MANUFACTURER: Cleveland Range, Inc.
MODEL NO.: KET20T (N058)
PERTINENT DATA: Self-Contained, 2/3 Steam Jacket Design
UTILITIES REQ'D: 15.8A, 480V, 3PH; ½" HW, ½" CW, 2" IW
ALTERNATE MFR.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories:
 - One (1) #VOK2 480-volt, 3-phase.
 - One (1) #KAK complete kettle accessory kit.
 - One (1) #CL20 lift-off cover.
 - One (1) #FS20 food strainer.
 - One (1) #LCH20 kettle lift-off cover holder.
 - One (1) #MS20 gallon measuring strip.
 - One (1) #DPK2 double pantry faucet with swing spout and bracket.
 - One (1) #316G1 316 stainless steel liner.
2. Electrical and mechanical services supplied through Utility Raceway, Item #15.

ITEM #19: COMBI OVEN

QUANTITY: One (1)
MANUFACTURER: Rational Cooking Systems, Inc.
MODEL NO.: SCC-62 E/SCC-102 E (N058)
PERTINENT DATA: Combi-Duo, Full Size, Self-Contained, SelfCooking Center® with Care Control
UTILITIES REQ'D: 22.1KW, 480V, 3PH; 37.0KW, 480V, 3PH; 3/4" CW, 2" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Three (3) years extended parts and labor warranty. All repairs to be performed by Rational factory certified service agents.
2. Accessories:
 - One (1) #60.71.932 Combi-Duo kit, stationary with 6" stainless steel legs with adjustable feet.
 - Twenty (20) #6019.1150 stainless steel 12" x 20" fry baskets.
 - Ten (10) #6010.2101 stainless steel 24" x 20" wire racks.
 - One (1) Everpure #EV9797-22 KleenSteam II Twin System Water Filter. Ship to Utility Raceway manufacturer for factory installation.
 - Rational Certified Installation.
 - Installation kit.
 - Chef Assistance Program.
 - One (1) bucket #56.00.210 cleaner tablets.
 - One (1) bucket #56.00.562 care tablets.
2. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #20: CONVECTION OVEN, MOBILE

QUANTITY: One (1)
MANUFACTURER: Blodgett Oven Company, Inc.
MODEL NO.: ZEPHAIRE-200-E DOUBLE (N058)
PERTINENT DATA: Double Section, Bakery Depth
UTILITIES REQ'D: (2) 11.0KW, 480V, 3PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories:
 - 480 volt/3PH operation.
 - Stainless steel front, both sides, top and solid back panels.
 - Four (4) heavy-duty 5" diameter polyurethane swivel casters, front two (2) with brakes.
2. Standard compliment of wire racks.
3. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #21: PASS-THRU HEATED CABINET, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHF132WP-FHG/FHG (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Exterior/Interior, Glass Doors
UTILITIES REQ'D: 7.8A, 120/208V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Full-height glass doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. Universal tray slide assembly installed on 5" centers in lieu of wire shelves, five (5) pair per compartment, ten (10) pair total, each unit.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Cord and twist-lock type plug set with matching receptacle furnished and installed by Electrical Contractor.

ITEM #22: PASS-THRU REFRIGERATOR, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RHT132WPUT-FHG/FHG (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Interior/Exterior, Glass Doors
UTILITIES REQ'D: 7.2A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Full-height glass doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. No. 1 - #16-gauge stainless steel, angle type, bottom support tray slides for 18" x 26" sheet pans in lieu of wire shelves installed on 3" centers, nine (9) pair per compartment, eighteen (18) total, each unit.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Cord and plug set.

ITEM #23: HOT TRANSPORT CABINET, MOBILE

QUANTITY: Two (2)
MANUFACTURER: CresCor
MODEL NO.: 1000-HH-SS-2DE (N058)
PERTINENT DATA: Two Compartment, Insulated, (16) 12" X 20" Pan Capacity, Stainless Steel Construction
UTILITIES REQ'D: 15.0A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories: (for each unit)
 - Full-perimeter wrap-around non-marking vinyl bumper.
 - Polyurethane casters, two (2) with brakes.
2. Cord and plug set.

ITEM #24: REACH-IN REFRIGERATOR, MOBILE

QUANTITY: One (1)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHT232NUT-HHS (N058)
PERTINENT DATA: Two-Section, Self-Contained, Stainless Steel Interior/Exterior
UTILITIES REQ'D: 8.2A, 120V, 1PH
ALTERNATE MFRS.: None

ITEM #24: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Half-height solid doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. Standard sealed wire shelves; furnish three (3) extra per section, twelve (12) total.
4. Exterior mounted digital thermometer.
5. 5" diameter heavy-duty swivel casters, front two (2) with brakes.
6. Cord and plug set.

ITEM #25: ICE MACHINE/BIN

QUANTITY:	One (1)
MANUFACTURER:	Hoshizaki America Inc.
MODEL NO.:	KM-350MAJ/B-300SF (N058)
PERTINENT DATA:	Air-Cooled, 489-Lb. Maker, 300-Lb. Bin, Crescent Cube, Energy Star
UTILITIES REQ'D:	9.05A, 120V, 1PH; 1/2" CW, 3/4" IW
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Stainless steel exterior finish, ice machine and bin.
2. Accessories:
 - One (1) Everpure #EV9324-21 InsurIce i2000² Single water filter system with Everpure #EV9534-26 Coarse Filter, mounted on manufacturer's common wall bracket.
 - 6" high stainless steel legs with adjustable bullet feet.
 - Custom fabricated stainless steel ice scoop holder mounted to right-hand side of bin per Detail, Sheet K-501.
3. Backflow prevention device installed on incoming water line by Plumbing Contractor.
4. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #26: SERVING COUNTER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Shelleysteel by The Delfield Company
MODEL NO.:	Modular Stainless Steel Interlocking Sections (N058)
PERTINENT DATA:	T-Shaped Configuration, #14 GA Stainless Steel Tops, All-Steel Construction With Laminated Panels
UTILITIES REQ'D:	----
ALTERNATE MFR.:	SpecLine by Low-Temp Industries

Refer to individual counter components listed under alpha headings for specification.

ITEM #26A: HOT FOOD COUNTER, MOBILE

QUANTITY: Four (4)
MANUFACTURER: Shelbesteel by The Delfield Company
MODEL NO.: SH-5-NU (N058)
PERTINENT DATA: Electrically Heated, Open Base, Five (5) Wells, With Drains
UTILITIES REQ'D: 40.0A, 120/208V, 1PH; 1/2" HW, 3/4" IW
ALTERNATE MFRS.: SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless steel tray slide with mitered end mounted on rigid brackets @ 29" A.F.F. Extend tray slide to span length of Item #26B: Solid Top Counter and interlock with Frost Top Counter.
2. (E) - 8" wide, full-length solid stainless steel fold-down work shelf on server's side.
3. FlexiShield® #DCFSFS full-length adjustable food shields with stainless steel finish uprights, radiant heat lamp and LED lights with shatterproof shield and on/off switch.
4. (F) - Line-up interlocks for counter body and tray slide.
5. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
6. Cord and plug set. Double cord hooks on bottom of unit.
7. (P) - Open understorage with bottom and intermediate stainless steel shelf.
8. (QQ) - Food wells with individual drains and quarter-turn ball valves plumbed to isolated manifold assembly with master shut-off valve within counter base on end opposite Item #26B with stainless steel hinged access door per Detail Sheet K-103.
9. Standard counter height of 36" A.F.F. Turn both end down to align and interlock with adjacent solid top counter.
10. Exterior body color as selected by Architect; K.E.C. to verify.
11. Accessories: (each unit)
 - T&S #B-0205LN deck-mounted single pantry fill faucet with #B-0208 swivel nozzle mounted on end opposite solid top counter.
 - Five (5) Vollrath #19196 stainless steel angled adapter plate.

ITEM #26B: SOLID TOP COUNTER, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Shelbesteel by The Delfield Company
MODEL NO.: SC-60-NU-MOD (N058)
PERTINENT DATA: Open Base, 60" Long
UTILITIES REQ'D: ----
ALTERNATE MFR.: SpecLine by Low-Temp Industries

ITEM #26B: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Shop Drawing and the following:

1. (F) - Line-up interlocks for counter body.
2. Open understorage with bottom and intermediate stainless steel shelf.
3. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
4. Modified counter height of 30" A.F.F.
5. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #26C: FROST TOP COUNTER, MOBILE

QUANTITY:	Two (2)
MANUFACTURER:	Shelleysteel by The Delfield Company
MODEL NO.:	SCFT-60-NU-MOD (N058)
PERTINENT DATA:	Mechanically Refrigerated Frost Top, Open Base
UTILITIES REQ'D:	7.0A, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.:	SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide solid stainless steel tray slide with mitered end mounted on rigid brackets @ 29" A.F.F., both sides
2. FlexiShield® #DCFSKD dual service full-length adjustable food shields with stainless steel finish uprights, LED lights with shatterproof shield and on/off switch.
3. (F) - Line-up interlocks for counter body and tray slide.
4. Cord and plug set. Double cord hooks on bottom of unit.
5. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
6. (P) - Open understorage with bottom stainless steel shelf.
7. Modified counter height of 30" A.F.F.
8. Provide drain line less shut-off valve. Plumber to extend copper drain line to nearest floor sink.
9. Provide two-piece removable washable frost top grate in equal sections.
10. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #26D: CASHIER'S STAND, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SCS-36-MOD (N058)
PERTINENT DATA: 36" Long x 36" Wide
UTILITIES REQ'D: 15A, 120V, 1PH (Dedicated Service)
ALTERNATE MFRS.: SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F., both sides.
2. (F) - Line-up interlocks for counter body and trayload.
3. (Q) – One (1) duplex receptacle mounted in counter base. Provide die-raised opening in top for power cord access.
4. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
5. Utility drawer assembly with locking provision mounted on end.
6. Cord and plug set. Double cord hooks on bottom of unit.
7. Standard counter working height of 36" A.F.F. Turn end down to align and interlock with adjacent Frost Top Counter.
8. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #27: CASH REGISTER - - (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Four (4)

ITEM #28: MILK COOLER, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Beverage-Air
MODEL NO.: SMF49HC-1-S
PERTINENT DATA: 49" Wide, Single Access, 12-Case Capacity, Forced-Air Type, R290 Hydrocarbon Refrigerant
UTILITIES REQ'D: 3A, 120V, 1PH
ALTERNATE MFRS.: Continental; True

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Stainless steel exterior and interior.
2. Cord and plug set.
3. Cylinder lid lock.

ITEM #28: (Continued)

4. Swivel casters with brakes.
5. Accessories:
 - #00C01-012A-01 corner bumper kit.

ITEM #29: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: STF49HC1-S (N058)
PERTINENT DATA: 49" Wide, Dual Access, 12-Case Capacity, Forced-Air Type, R290 Hydrocarbon Refrigerant
UTILITIES REQ'D: 3.3A, 120V, 1PH
ALTERNATE MFRS.: Continental/OOLP; True

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Stainless steel exterior and interior.
2. Cord and plug set.
3. Cylinder lid lock.
4. Swivel casters with brakes.
5. Accessories:
 - #00C01-012A-01 corner bumper kit.

ITEM #30: ICE CREAM CABINET, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Nor-Lake
MODEL NO.: FTB31-6 (N058)
PERTINENT DATA: 7.4 Cu. Ft. Capacity, Stainless Steel Top, White Painted Cabinet, Sliding Glass Lids With Lock & Keys
UTILITIES REQ'D: 1.1A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Cord and plug set.

ITEM #31: ELECTRONIC MENU BOARD -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Four (4)

Furnished by Owner and installed by K.E.C. per Equipment Plan, Sheet K-101 and Manufacturer's Instructions.

ITEM #32: PAN RACK CART, MOBILE

QUANTITY: Two (2)
MANUFACTURER: CresCor
MODEL NO.: 207-1820 (N058)
PERTINENT DATA: Fixed Angles, (20) 18x26 Pan Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Lakeside, InterMetro

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Full-perimeter wrap-around non-marking vinyl bumper.

ITEM #33: MOP SINK CABINET -- (N.I.K.E.C. – SPECIFIED BY PLUMBING DIVISION)

QUANTITY: One (1)

ITEM #34: POT WASHING SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 10'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: (2) 3/4" HW, (2) 3/4" CW, (3) 2" IW"
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Front and end edge rolls per Detail 1.02B.
2. 13" high back and partial right end splash per Detail 1.04B.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Stainless steel undershelf on both ends per Detail 1.11.
7. Full-length table-mounted stainless steel overshelf per Detail 1.12A.
8. Pot sink and drainboards per Detail 3.01.
9. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
10. Accessories:
 - Two (2) T&S #B-0290 backsplash-mounted swing spout faucets.
 - Three (3) T&S #B-3950-01 twist handle drains with rear-connected over-flows, handle bracket and basket strainer.

ITEM #34: (Continued)

11. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades.

ITEM #35: TRASH CONTAINER, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Rubbermaid Commercial Products, Inc.
MODEL NO.: FG263200GRAY (N058)
PERTINENT DATA: 32-Gallon Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Gray in color.
2. Accessories: (each unit)
 - One (1) #FG264000BLA conversion dolly.
 - One (1) #FG263100GRAY matching flat lid.

ITEM #36: SOILED DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 11'-0"± x 6'-6"± Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front edge roll per Detail 1.02B.
2. 13" high back and right end splash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Soiled dishtable per Detail 2.02.
7. Provide stainless steel crossrails under pass-thru window for storage of 20" x 20" dish/glass racks.
8. 20" wide x 8" deep integral pre-rinse sink with one-piece removable #20 gauge perforated stainless steel scrap basket with 1" diameter fully welded tubular cross-rails set flush with tabletop.

ITEM #36: (Continued)

9. Sound-deaden underside of sink and drainboard with NSF-approved sound dampening material.
10. Accessories:
 - One (1) Component Hardware #D63-4161 box pattern drain assembly welded to underside of pre-rinse sink.

ITEM #37: RETRACTABLE HOSE REEL

QUANTITY: One (1)
MANUFACTURER: Fisher Manufacturing Company
MODEL NO.: 2980 (N058)
PERTINENT DATA: Wall-Mounted, Open No Cover
UTILITIES REQ'D: 3/4"HW, 3/4"CW
ALTERNATE MFR.: T&S Brass

Furnish and install per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Mount hose reel assembly on wall with bottom of spray head @ 6'-0" A.F.F. when in fully retracted position.
2. Accessories:
 - One (1) Aquatrol Model #1801 recessed stainless steel control cabinet with valves, gauges, fittings and components for a complete system.

ITEM #38: DISHMACHINE

QUANTITY: One (1)
MANUFACTURER: Hobart Corporation
MODEL NO: CL44EN-BAS+BUILDUP (N058)
PERTINENT DATA: Fully Automatic Rack-Type, Power Wash, 180° F Final Rinse, Built-In Booster Heater
UTILITIES REQ'D: 27.9A, 480V, 3PH; 30.0KW, 480V, 3PH (Booster Heater); 10.0A, 120V, 1PH (Drain Cooling Kit); 3/4" HW (180°F.), 1/2" CW (Drain Cooling Kit), 2" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Soap dispensing system and rinse additive system by soap chemical vendor.
2. Stainless steel feet, frame, legs and front panel.
3. Common drain manifold and tank fill.
4. Automatic fill with safety switch at drain valve handle.
5. Energy savings auto-timer control package with table-limit switch.
6. Electric tank heat.

ITEM #38: (Continued)

7. Right-to-left operation.
8. Vent fan control.
9. Accessories:
 - Two (2) #EXTHD 4"x16" extended vent hoods with locking damper.
 - Two (2) #SHTPAN-RACK open-end 20"x20" racks for 18"x26" sheet pans.
 - Six (6) #DISHRAK-PEG20 peg-type, and four (4) #DISHRAK-COM20 combination-type 20"x20" plastic racks
 - Two (2) stainless steel splash shields.
 - One (1) #DTV-CLEN drain water tempering kit.
 - One (1) #ERH30K 30KW built-in booster heater.
 - One (1) #CLE/TBL-SWITCH table limit switch.
 - One (1) #1/2INSHK-ABSRBR water hammer arrestor kit.
 - One (1) #SPCYES single-point electrical connection.
 - One (1) #HTG6HI stainless steel frame with 6" extended height chamber.

ITEM #39: VENT DUCT

QUANTITY: Two (2)
MANUFACTURER: Custom Fabricated
MODEL NO.: Stainless Steel
PERTINENT DATA: ----
UTILITIES REQ'D: 300 CFM (Load End), 600 CFM (Unload End)
ALTERNATE MFRS.: None

Fabricate and install per Equipment Plan, Sheet K-101, and the following:

1. Constructed and installed per Detail 5.06.

ITEM #40: CLEAN DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 5'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front and left end edge roll per Detail 1.02B.
2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.

ITEM #40: (Continued)

5. Stainless steel undershelf per Detail 1.11.
6. Dishtable per Detail 2.02.
7. Sound-deaden underside of tabletop with NSF-approved sound-dampening material.
8. Install table-limit switch (supplied with Dishmachine, Item #38) in end of dishtable, interwired by Electrical Contractor.

ITEM #41: POT & PAN SHELIVING, MOBILE

QUANTITY:	One (1)
MANUFACTURER:	InterMetro Industries Corporation
MODEL NO.:	MetroMax i (N058)
PERTINENT DATA:	Open Grid Shelf, Polymer
UTILITIES REQ'D:	----
ALTERNATE MFR.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. One (1) #MX2448G section; 24" W x 48" L x 4-tier high.
2. Four (4) #MX63UP polymer posts for stem casters, 61-3/16" high.
3. Two (2) #5MPX polyurethane swivel casters with donut bumpers.
4. Two (2) #5MPBX polyurethane casters with brakes and donut bumpers.
5. Plastic wedge lock connectors, quantity as required.
6. Locate bottom shelf @ 18" A.F.F., space remaining shelves equally.
7. Accessories:
 - One (1) #MTR2448XE tray drying rack.
 - Five (5) #MXD24-8 shelf dividers.

ITEM #42: WASHER

QUANTITY:	One (1)
MANUFACTURER:	Electrolux
MODEL NO.:	EFLS517S TT/IW (N058)
PERTINENT DATA:	27" Electric Front Load, 4.3 Cu. Ft. Capacity, Island White
UTILITIES REQ'D:	12.0A, 120V, 1PH, 3/4" HW, 3/4" CW, 1-1/4" IW
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #43: DRYER

QUANTITY: One (1)
MANUFACTURER: Electrolux
MODEL NO.: EFDE317TIW (N058)
PERTINENT DATA: 27" Electric Front Load, 8.0 Cu. Ft. Capacity, Island White
UTILITIES REQ'D: 30.0A, 208V, 1PH, 3/4" HW, 3/4" CW, 1-1/4" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #44: FLOOR TROUGH

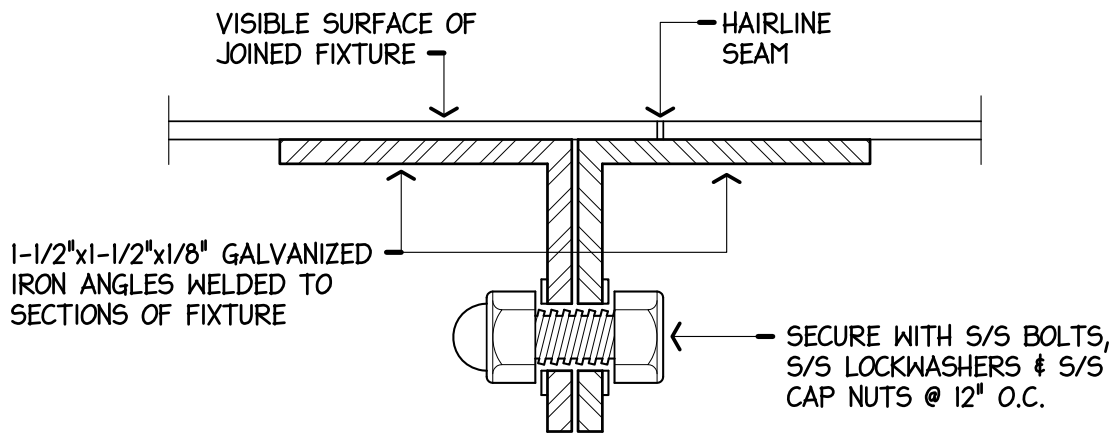
QUANTITY: One (1)
MANUFACTURER: IMC Teddy Foodservice Corporation
MODEL NO.: ASFT-1824-SGAS (N058)
PERTINENT DATA: Anti-Spill, 14 GA S/S, Serrated Top, Anti-Slip Grating
UTILITIES REQ'D: 4" W
ALTERNATE MFRS.: None

Furnish and install per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. 2'-0" long x 1'-6" wide, constructed and installed per Detail, Sheet K-102.
2. SGAS-18 anti-slip serrated stainless steel subway style removable floor grate in equal sections, the lessor of 30 lbs. and/or 20" long.
3. Bottom of trough pitched to integral stainless steel waste cup with removable perforated stainless steel basket.
4. Top of trough installed flush with top of kitchen finished floor.
5. Unit furnished by K.E.C.; installed by Plumbing Contractor.

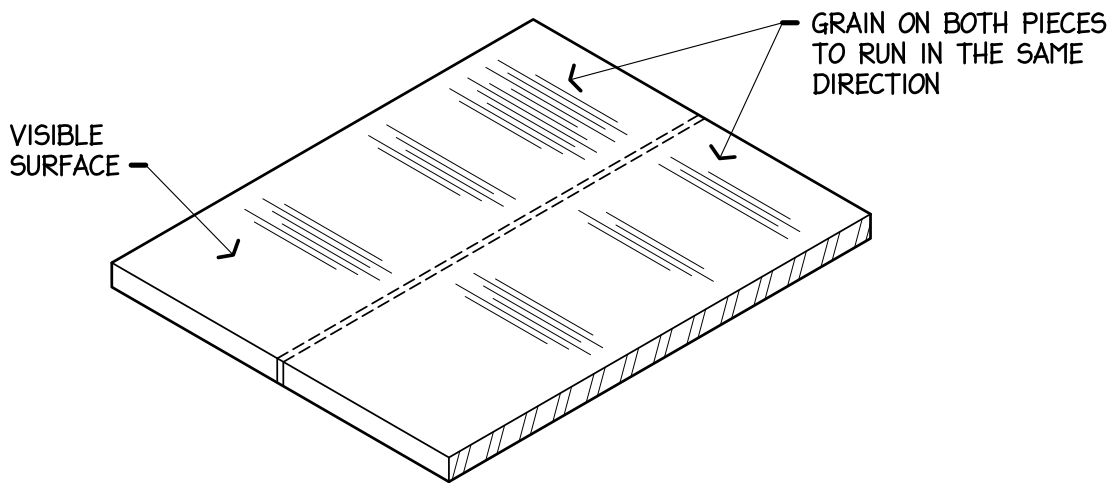
(END OF FOODSERVICE ITEMIZED SPECIFICATIONS)

STANDARD DETAILS



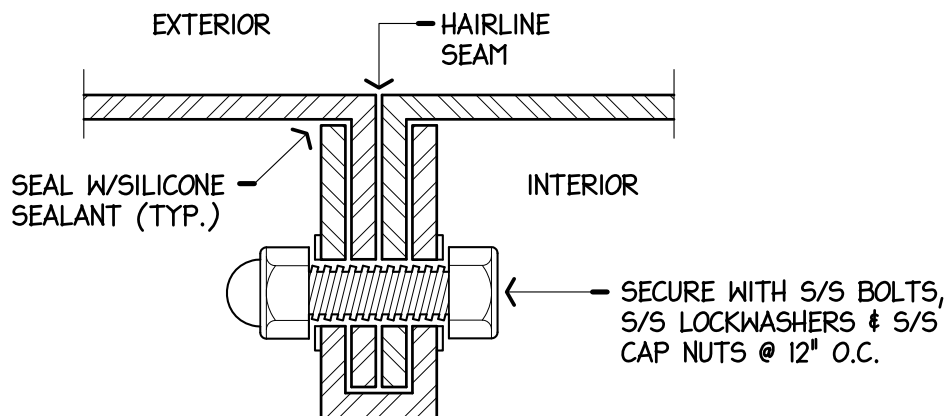
NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT



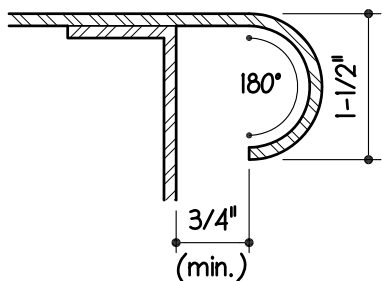
NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT

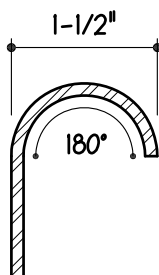


NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

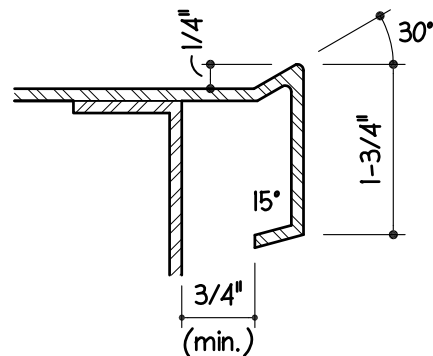
C. RAISED CAP SEAM - KNUCKLE JOINT



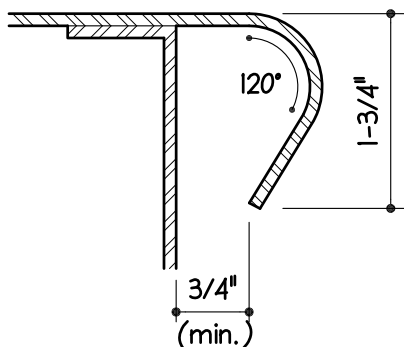
ROLLED A.



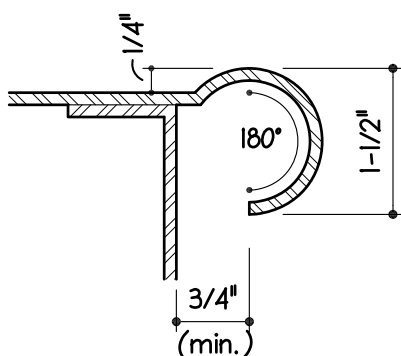
RAISED ROLLED B.



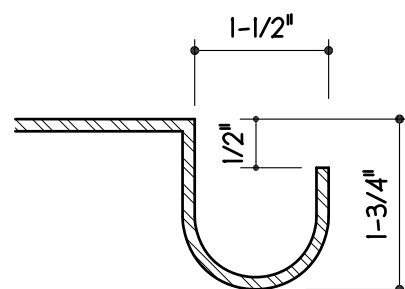
INVERTED "V" EDGE C.



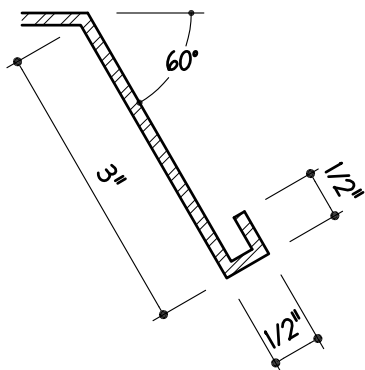
BULL NOSE ROLLED D.



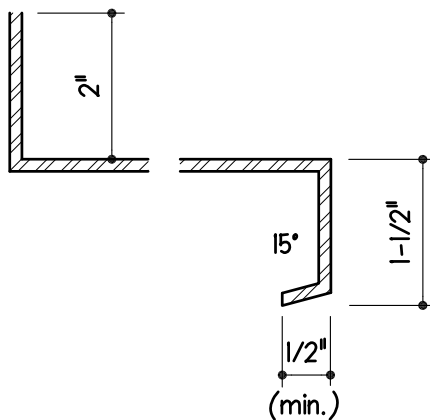
MARINE EDGE E.



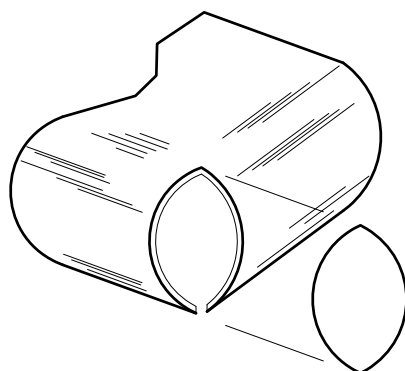
FLOUR GUTTER F.



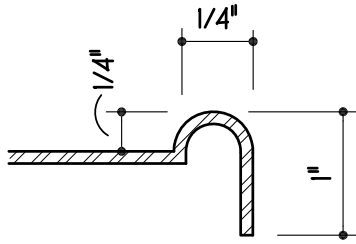
RECIPE CARD HOLDER G.



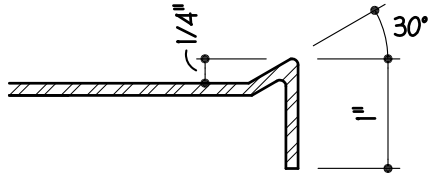
UNDERSHELF EDGE H.



BULL NOSE CORNER I.

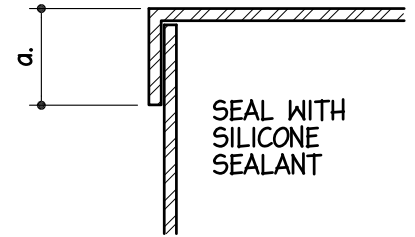


RAISED OPENING EDGE J.

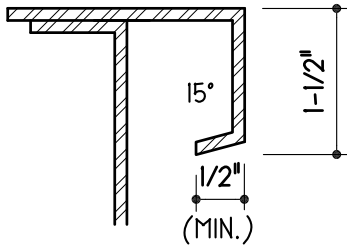


RAISED OPENING EDGE K.

a. AS SPECIFIED. TO
MATCH ADJACENT
ROLLED EDGES



STRAIGHT TURN DOWN L.

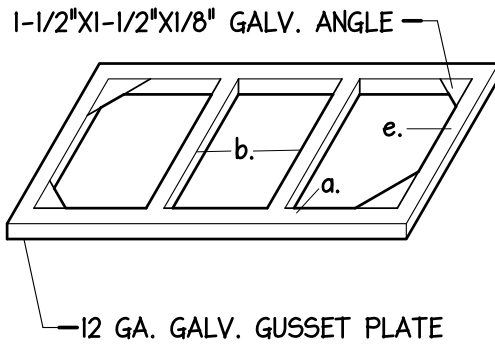


TURNED DOWN EDGE M.



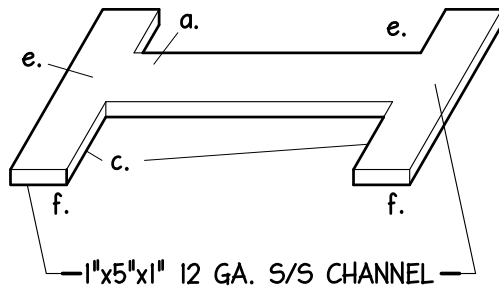
- ### DETAIL B

- 114000-55**



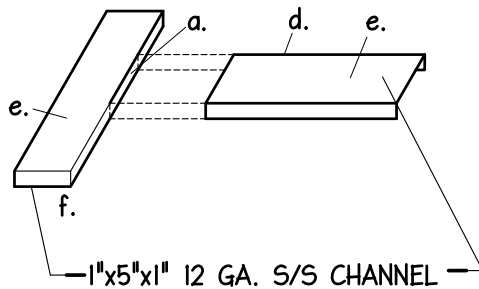
TABLES

A.



DISHTABLES

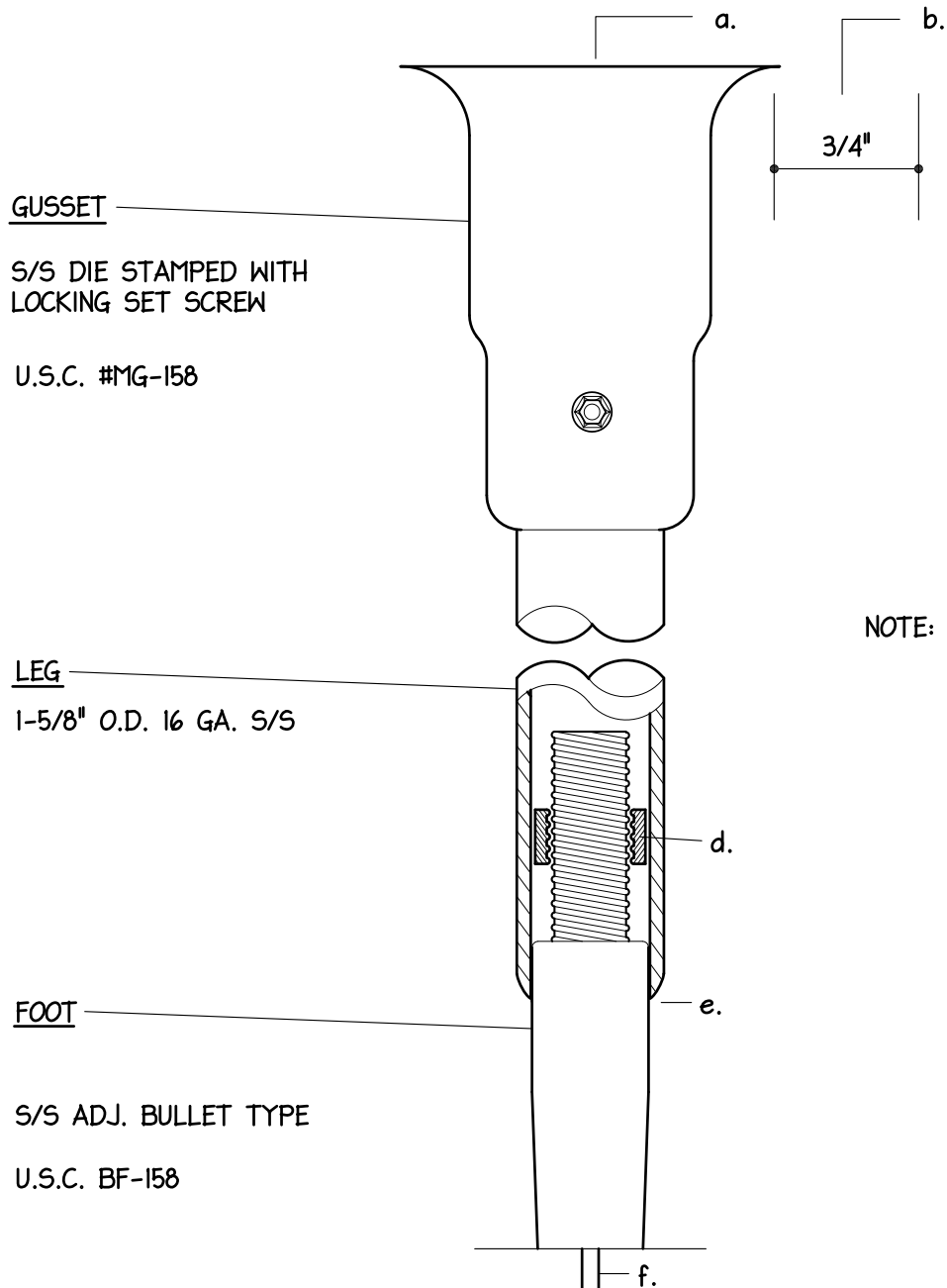
B.



SINK DRAINBOARDS

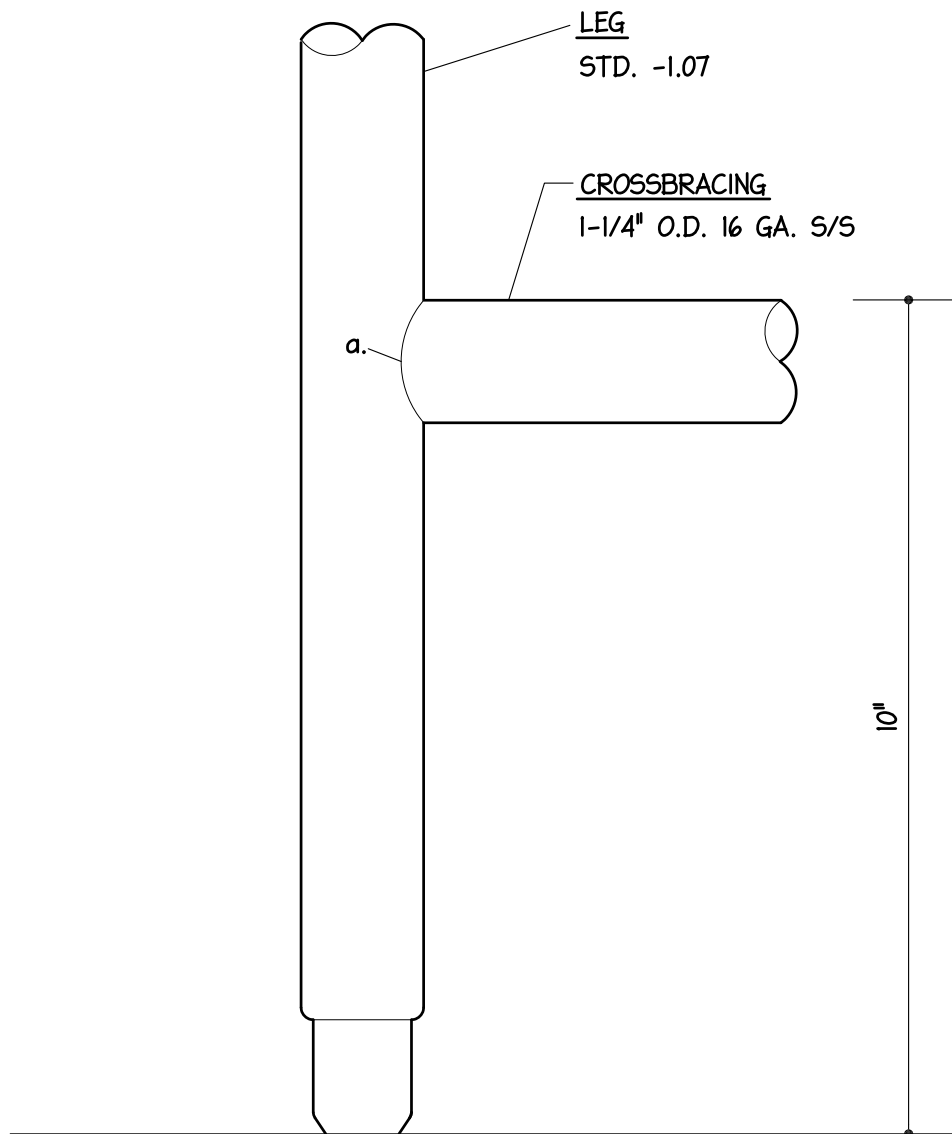
C.

- a. FULLY WELDED CONSTRUCTION.
- b. ANGLE LOCATION - ENDS; SIDES OF TOP INSETS; INTERMEDIATES
24" ON CENTER.
- c. CHANNEL LOCATION - ENDS AND INTERMEDIATE MAXIMUM 6'-6" O.C.
- d. ADD CENTER CHANNEL WHEN DRAINBOARD LENGHT EXCEEDS 2'-0".
- e. SECURE TOP TO FRAMEWORK WITH WELDED STUDS, S/S LOCKWASHERS
AND CAP NUTS.
- f. CLOSE CHANNEL AT FRONT ONLY.

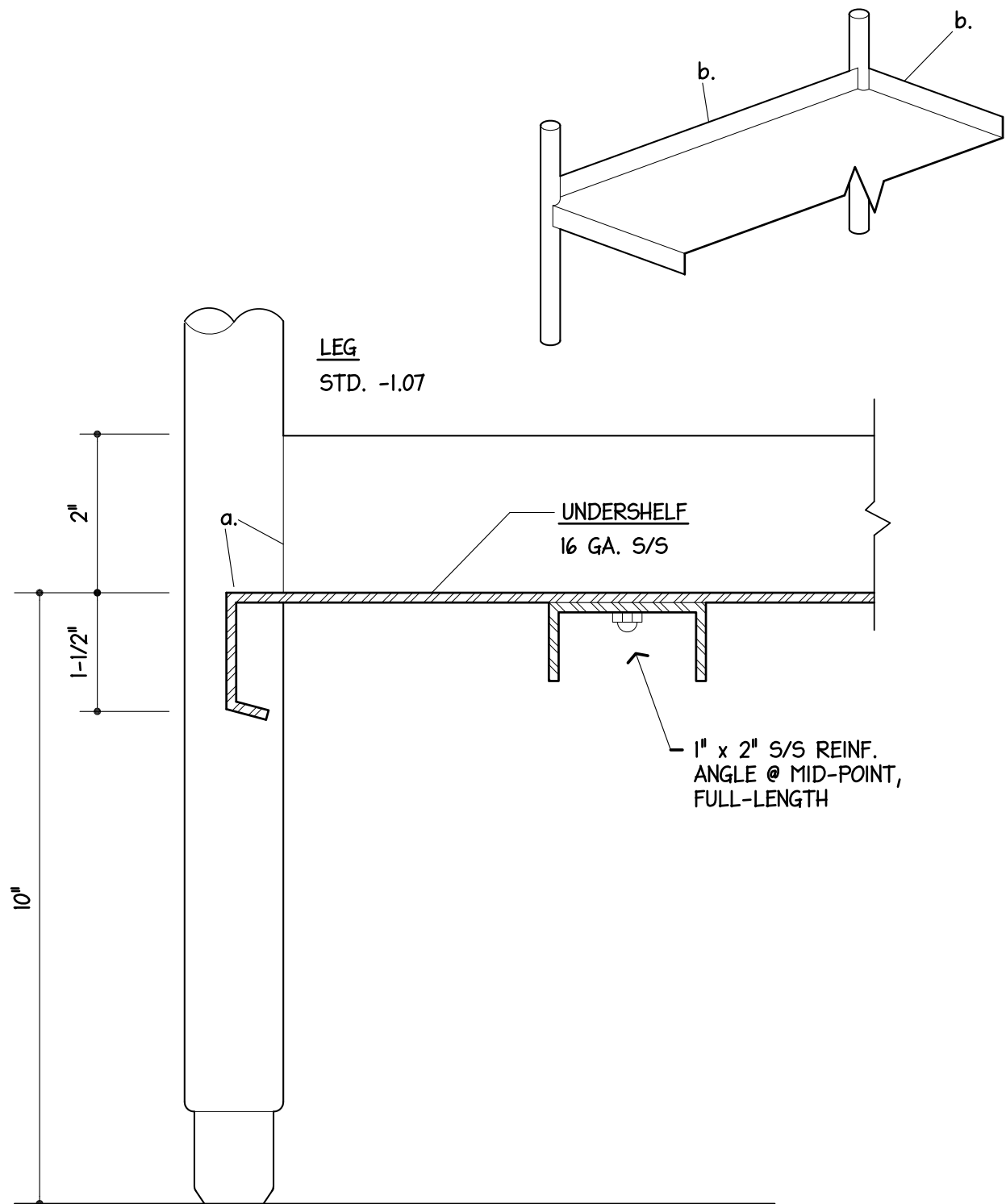


NOTE: ENTIRE FINISHED
STRUCTURE AND
INDIVIDUAL COMPONENTS
TO MEET NSF
REQUIREMENTS

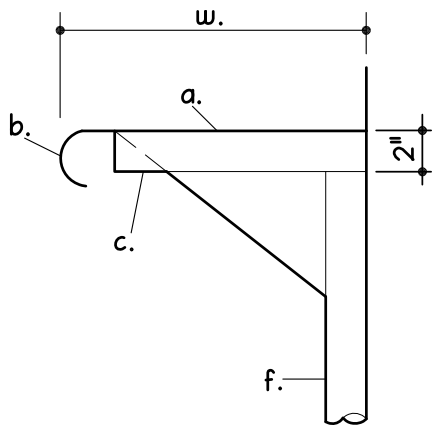
- a. FULLY WELD GUSSET TO FRAMEWORK OR SINK
- b. 3/4" MINIMUM CLEARANCE ALL AROUND
- c. SET SCREW NOT VISIBLE TO WORKING SIDE OF EQUIPMENT.
- d. MAXIMUM 1/32" CLEARANCE BETWEEN LEG AND FOOT
- e. FOOT SET AT MIDPOINT TO ALLOW 1" ADJUSTMENT UP AND 1" DOWN.
WITHOUT THREAD EXPOSURE.
- f. LEGS UNSUPPORTED Laterally BY CROSSBACKING OR UNDERSHELVES SHALL BE
PINNED TO FLOOR USING 1/4" DIA. X 1/2" PINS WELDED TO FOOT AND SET IN
MATCHING HOLES IN THE FLOOR.



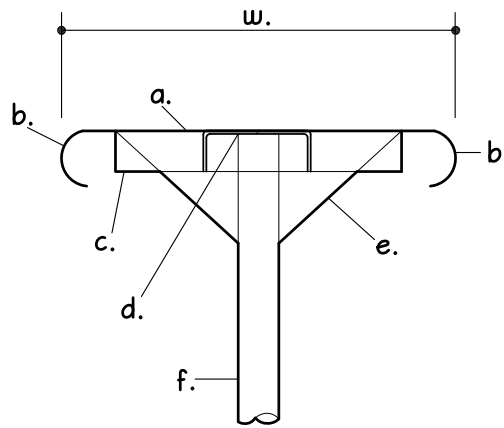
a. FULLY WELD, GRIND SMOOTH AND POLISH.



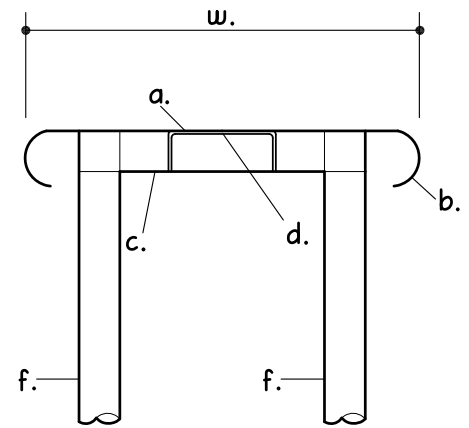
- a. FULLY WELD, GRIND SMOOTH AND POLISH.
- b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2".



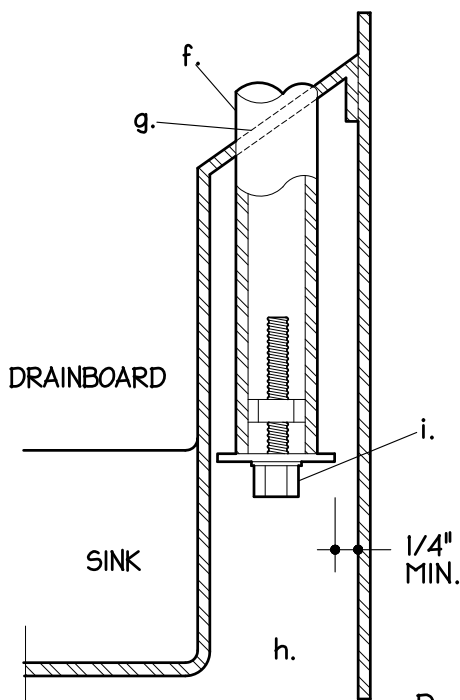
A.



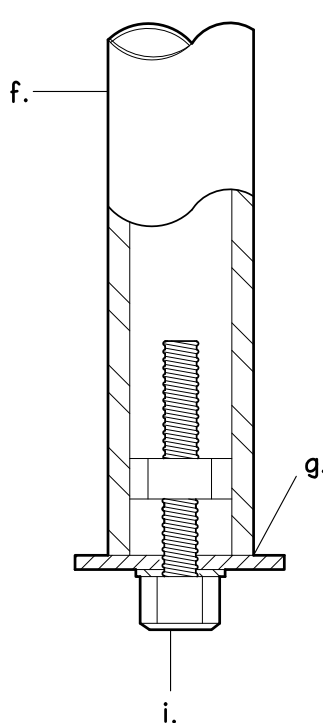
B.



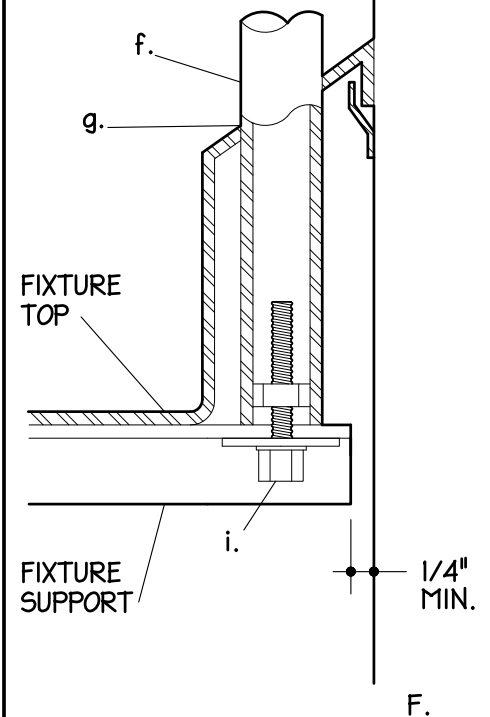
C.



D.

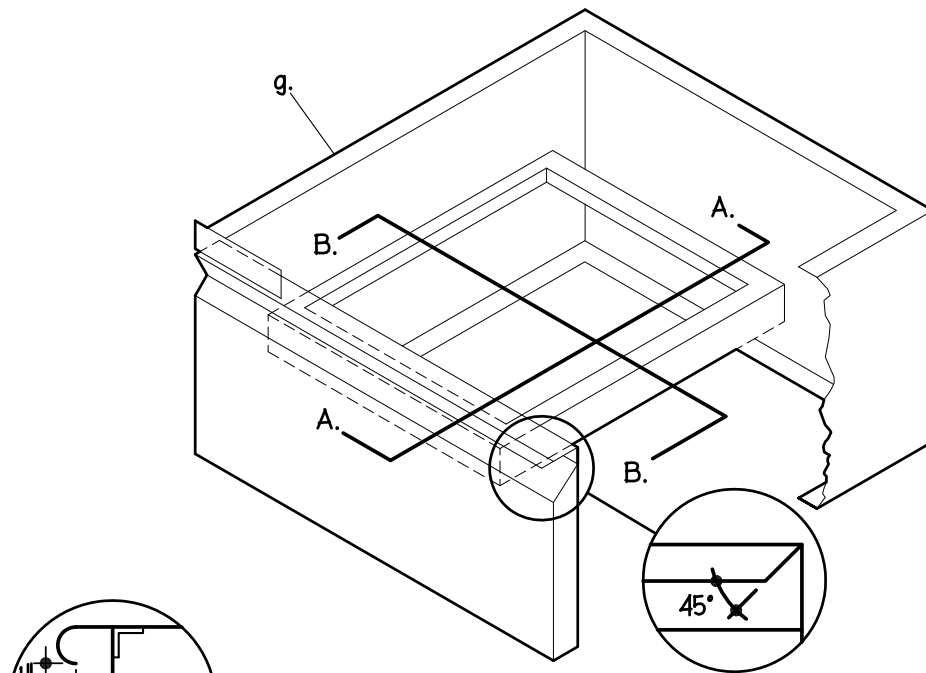


E.

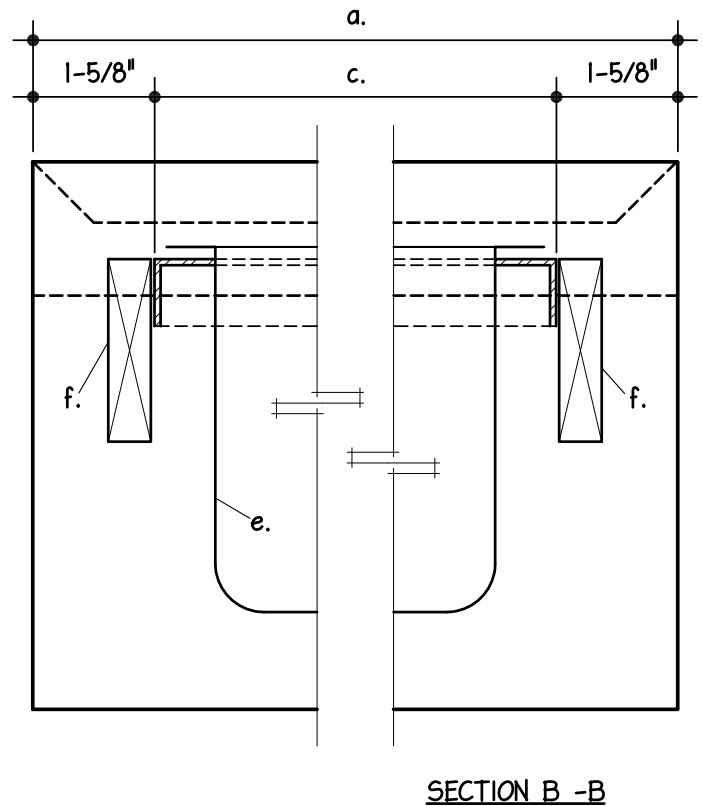
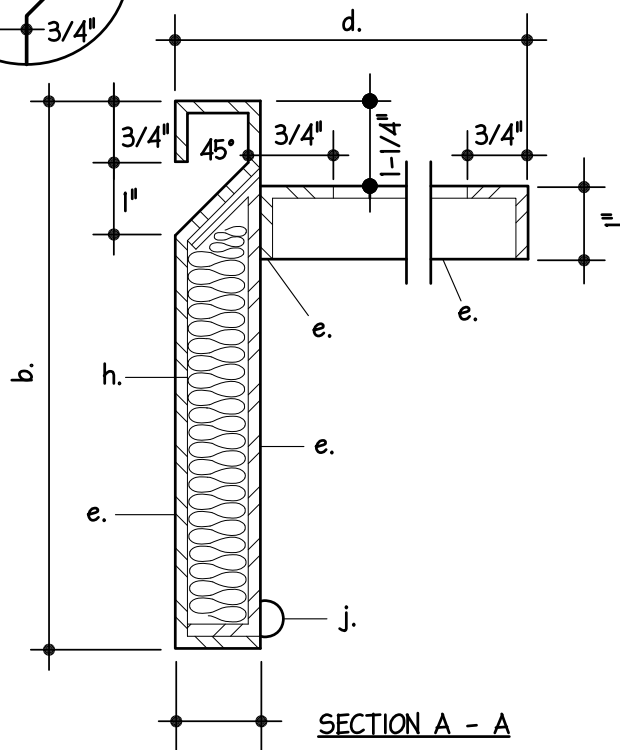
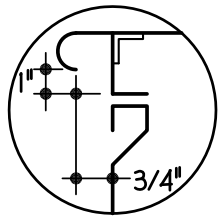


F.

- a. 16 GA S/S SHELF
- b. STD.- 1.02 EDGE
- c. 1"x 3"x 1" 14 GA. S/S CROSS CHANEL
- d. 1"x 3"x 1" 14 GA. S/S LENGTHWISE CHANNEL WHEN LENGTH BETWEEN SUPPORTS EXCEEDS 42"
- e. 14 GA. S/S BRACKETS FULLY WELDED TO SUPPORT AND CHANNEL..
- f. 1-1/4" O.D. 16 GA. S/S UPRIGHT. MAXIMUM 5'-0" ON CENTER.
- g. TIGHT FIT. SEAL WITH SILICONE SEALANT.
- h. 1-1/2"x 1-1/2" 12 GA. S/S CLIPS WELDED TO REAR OF SPLASH AT DRAINBOARD HEIGHT.
- i. 3/8"x 16 S.S. HEX HEAD BOLT, S/S NUT & S/S LOCKWASHER. NUT WELDED IN TUBE.
- w. WIDTH AS SPECIFIED.

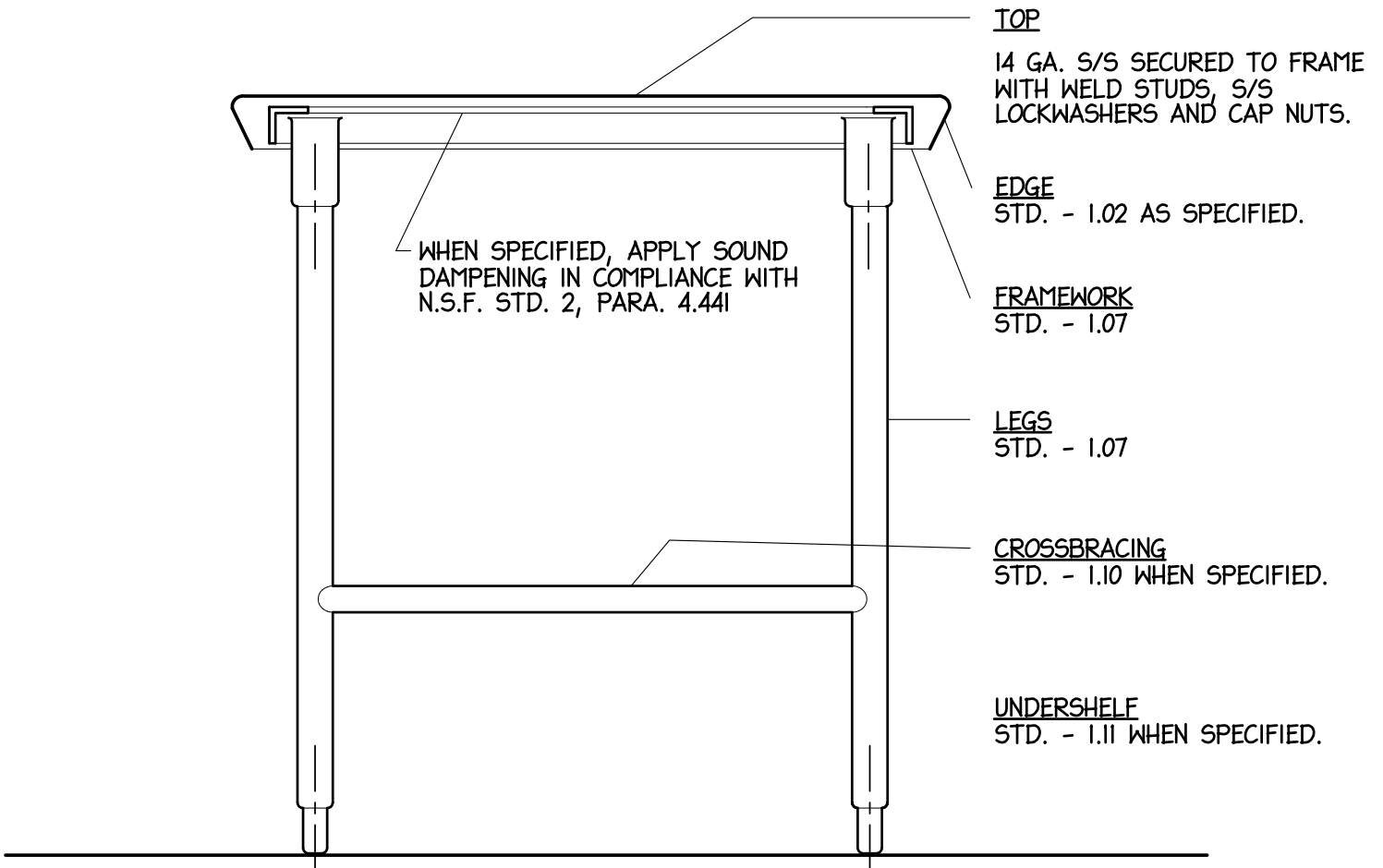
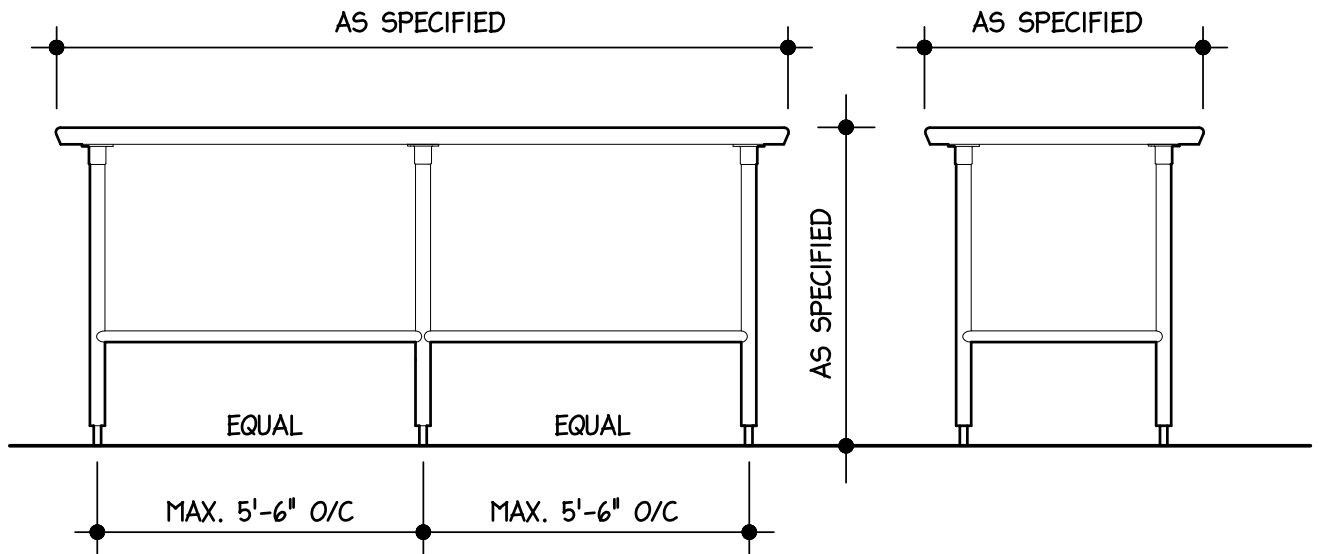


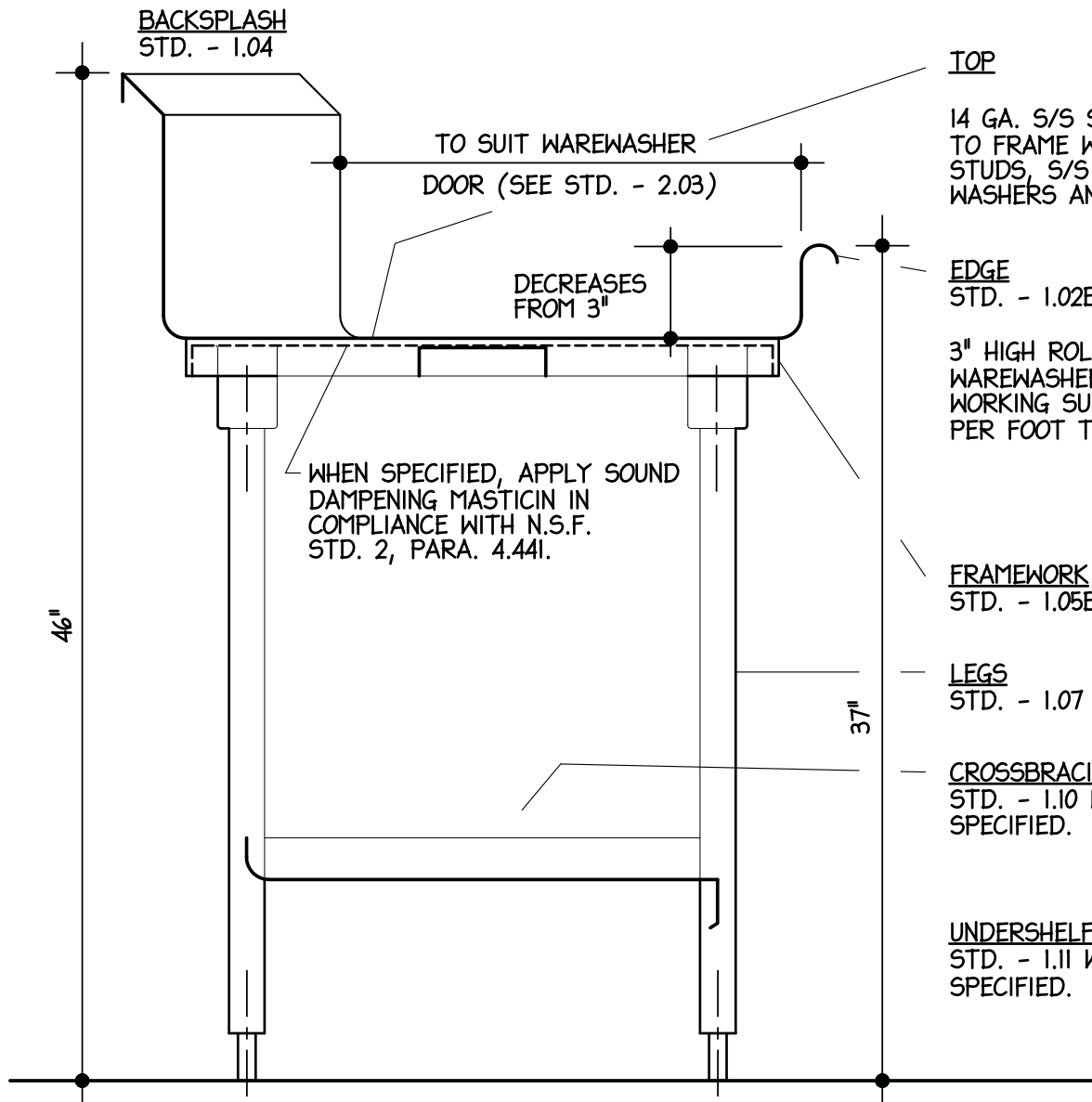
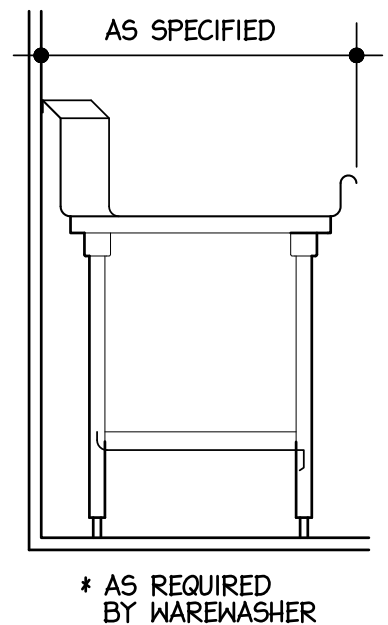
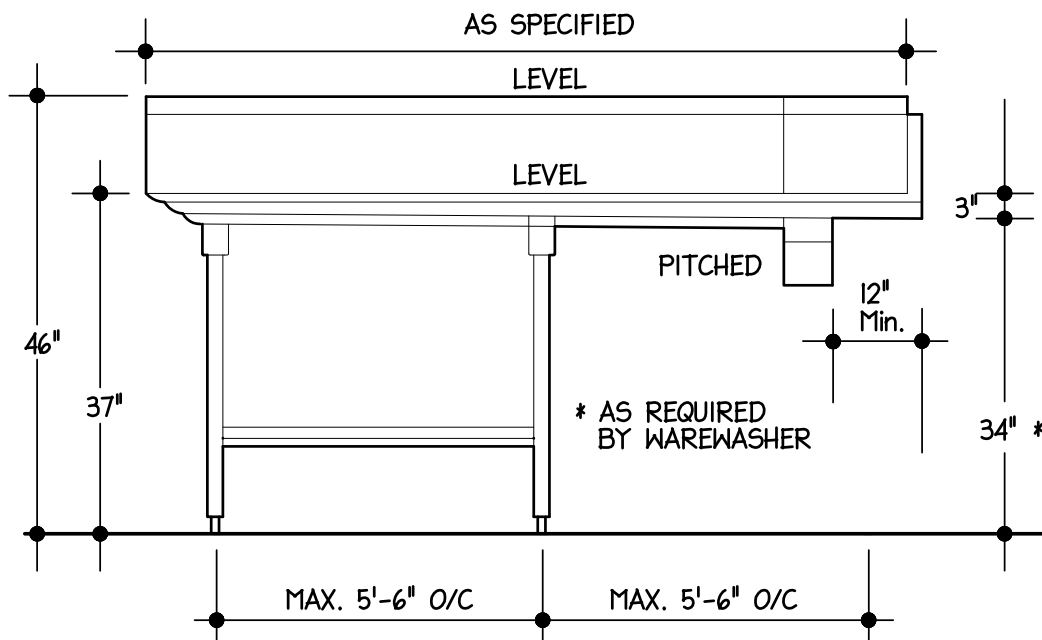
- e. 16 GA. S/S ALL WELDED.
- f. 3 PIECE SELF CLOSING DWR. SLIDE AS MFD. BY COMPONENT HARDWARE, S52 SERIES WITH S/S ROLLER BEARINGS. PITCH SLIDE DOWNWARD 3/8" PER FOOT FOR SELF-CLOSING ACTION.
- g. 18 GA. S/S DWR. ENCLOSURE. ALL WELDED.
- h. SEMI - RIGID FIBERGLASS SOUND DAMPENING.
- j. HARD RUBBER DRAWER BUMPER EACH CORNER.



i. PROVIDE DIE - STAMPED #18 GA. S/S DWR. PANS AS FOLLOWS:

TYPE	NO.	PANS	a.	b.	c.	d.
I	1	20x20x5 DP.	25	7-1/2	21-3/4	22-3/4
II	1	20x20x8 DP.	25	10-1/2	21-3/4	22-3/4
III	1	12x20x4 DP.	25	6-1/2	21-3/4	14-1/2
IV	2	12x20x4 DP.	28	6-1/2	26-1/4	22-1/2
V	1	12x20x4 DP.	17	13-1/2	13-1/2	22-1/2





TOP

14 GA. S/S SECURED
TO FRAME WITH WELDED
STUDS, S/S LOCK-
WASHERS AND CAP NUTS.

EDGE

STD. - 1.02B

3" HIGH ROLLED EDGE AT
WAREWASHER. PITCH
WORKING SURFACE 1/8"
PER FOOT TO WAREWASHER.

FRAMEWORK

STD. - 1.05B

LEGS

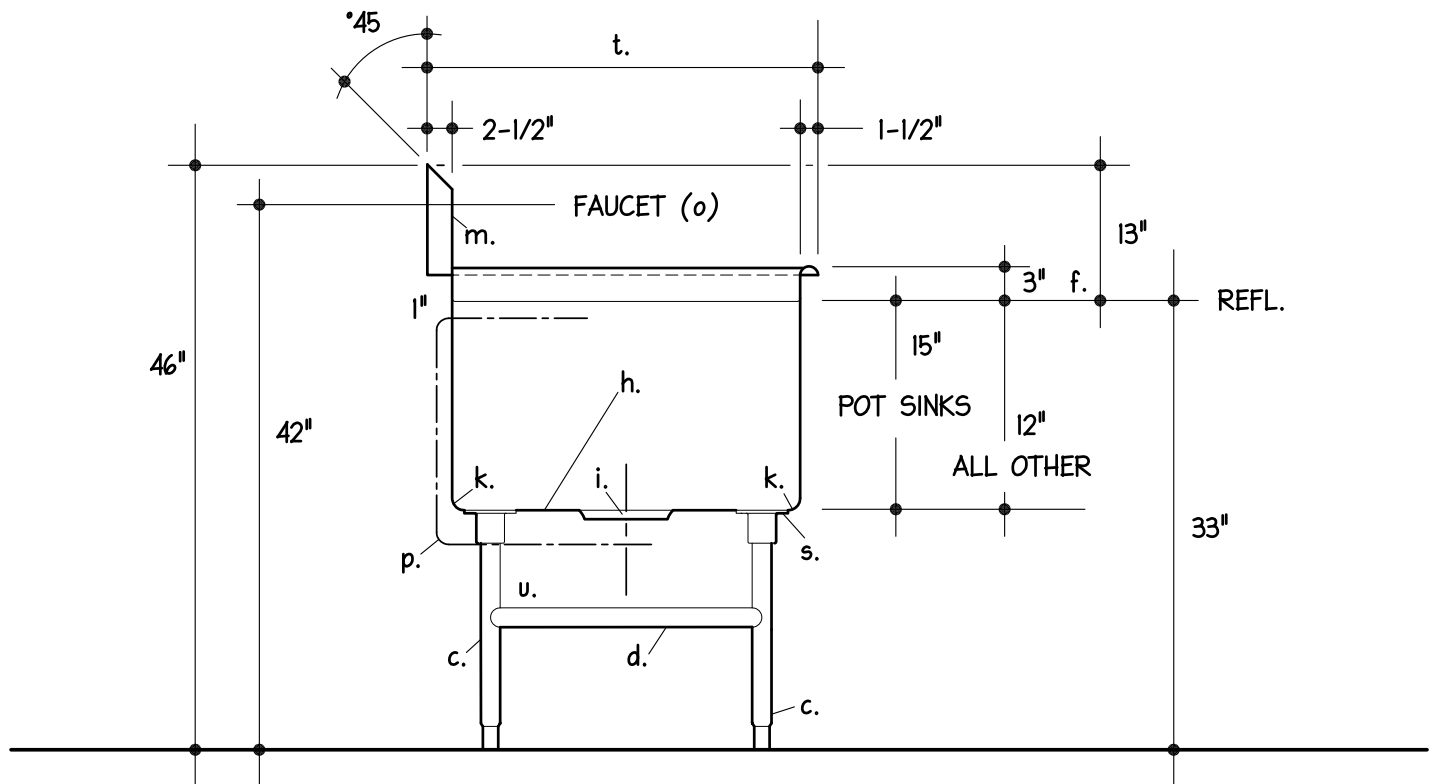
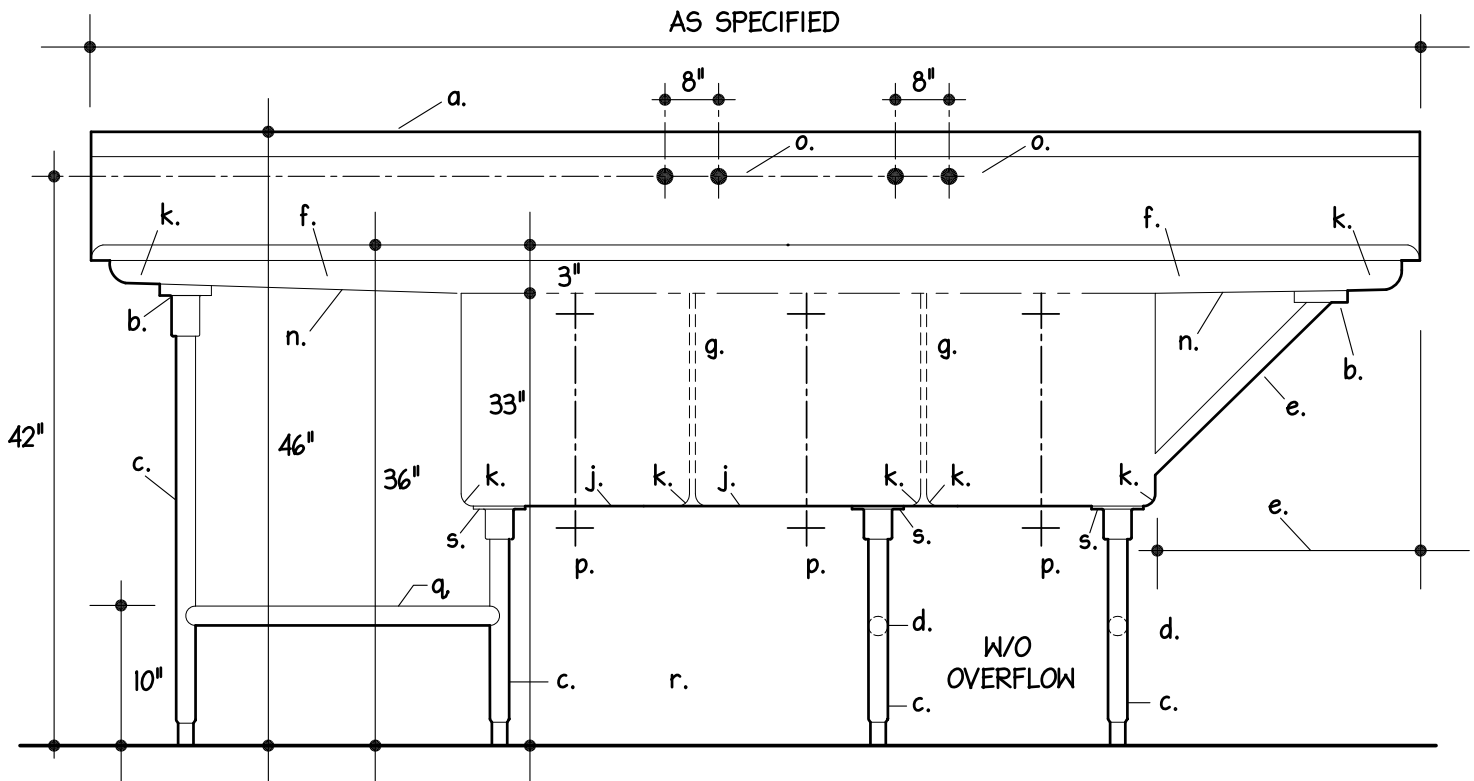
STD. - 1.07

CROSSBRACING

STD. - 1.10 WHEN
SPECIFIED.

UNDERSHELF

STD. - 1.11 WHEN
SPECIFIED.



a. MATERIAL - 14 GA. S/S.

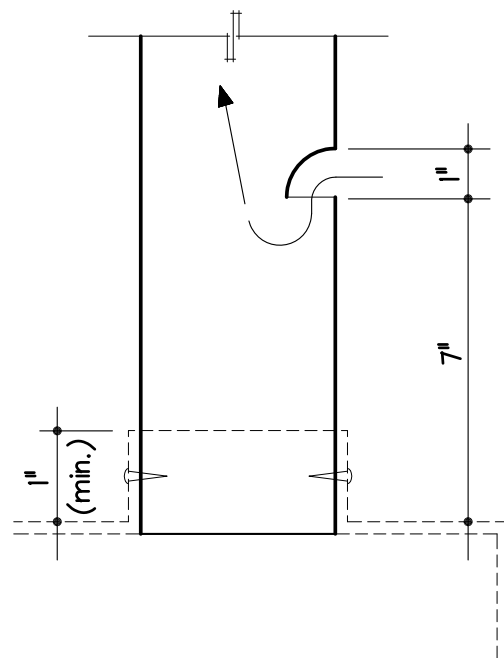
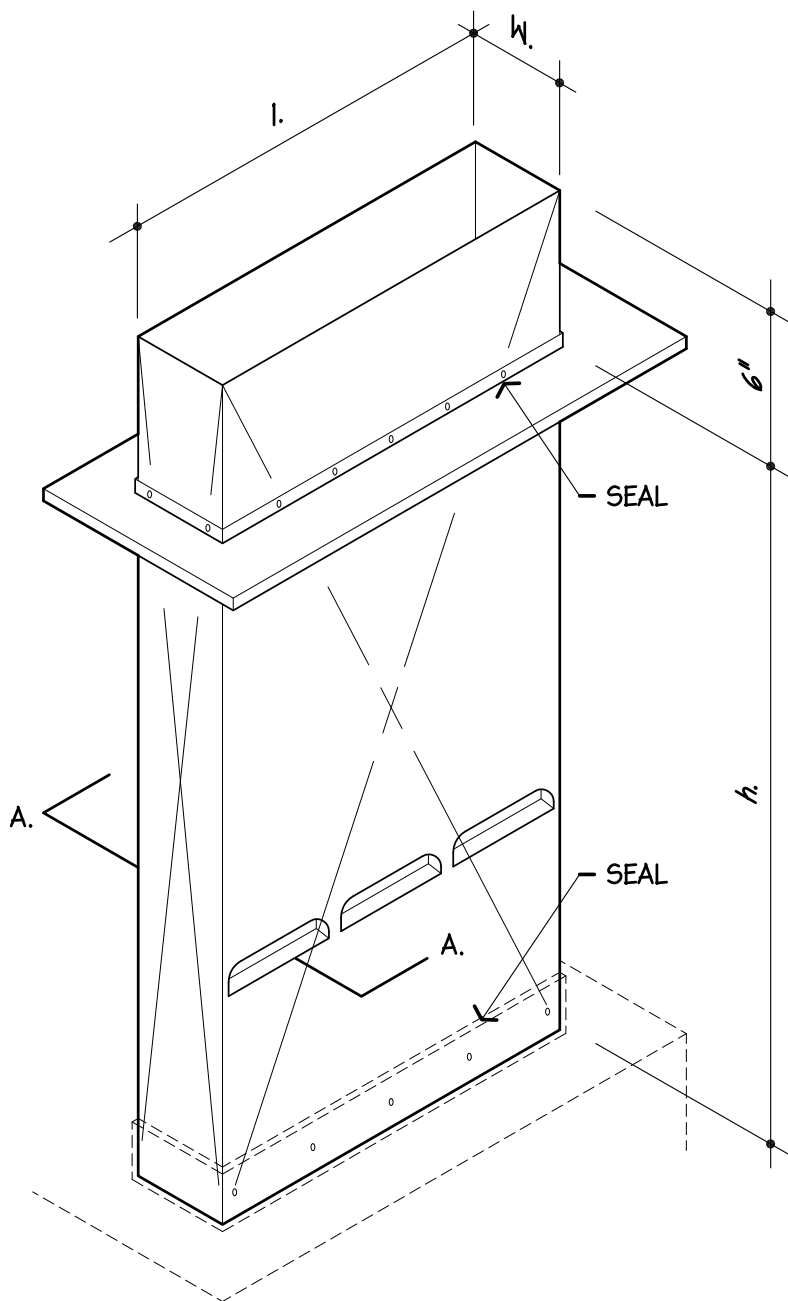
c. STD. - 1.07

b. STD. - 1.05c.

d. STD. - 1.10

CONTINUED ON STD.- 3.01.1

- e. DRAINBOARDS UP TO 24" IN LENGTH REQUIRE NO LEGS OR BRACES. DRAINBOARDS 25" TO 30" REQUIRE 1" O.D. 16 GA. S/S BRACE. DRAINBOARDS OVER 30" REQUIRE LEGS AND CHANNEL FRAMEWORK.
- f. DRAINBOARDS SHALL PITCH TO SINK 1/8" PER FOOT OF LENGTH TO PROVIDE COMPLETE DRAINING WITHOUT POOLING. THE 3" HIGH RAISED ROLLED RIM AT THE SINK SHALL DECREASE IN HEIGHT TOWARD THE OUTER ENDS OF THE DRAINBOARD.
- g. PARTITIONS BETWEEN COMPARTMENTS TO BE DOUBLE WALLED CONSTRUCTION WITH ROUNDED TOP, ALL WELDED INTEGRAL WITH SINK BODY.
- h. BACK, BOTTOM, AND FRONT SHALL BE ONE CONTINUOUS PIECE WITH ENDS WELDED INTEGRAL, WITHOUT OVERLAPPING JOINTS OR OPEN SPACES, BETWEEN COMPARTMENTS.
- i. WASTES SHALL BE SEATED IN DIE STAMPED DEPRESSIONS WITHOUT USE OF SOLDER, RIVETS OR WELDING. INSTALLED COMPONENTS SHALL BE FLUSH WITH SURROUNDING SURFACE.
- j. EACH SINK COMPARTMENT TO BE PITCHED AND CREASED TO WASTE TO ASSURE COMPLETE DRAINING WITHOUT POOLING.
- k. ENTIRE UNIT SHALL BE ALL WELDED COVE CORNERED CONSTRUCTION WITH VERTICAL AND HORIZONTAL AND INTERIOR CORNERS HAVING A 3/4" RADIUS.
- l. STD.- 1.02 b EDGE.
- m. STD. - 1.04a. BACKSPLASH.
- n. UNDERSIDE OF DRAINBOARDS AND SINKS TO BE SPRAYED WITH SOUND DAMPENING IN COMPLIANCE WITH N.S.F. STD. 2 PARA 4.44I WHEN SPECIFIED.
- o. FAUCETS - T&S MODEL B-232 WITH AERATOR B-199, REMOVABLE MONEL SEATS AND 1/2" I.P.S. MALE INLETS.
- p. WASTES - 2" NICKEL PLATED BRONZE ROTARY HANDLE WASTE S/S STRAINER PLATE WITH CHROME WITH CHROME PLATED BRASS CONNECTED OVERFLOW, STANDARD- KIEL HARDWARE MFG. CO. #1770-1015-1000.
- q. REAR CROSS BRACING ONLY.
- r. OMIT FRONT AND REAR LENGTHWISE CROSSBRACIG UNDER SINKS.
- s. 12 GAUGE STAINLESS STEEL 6"x 6" TRIANGULAR SUPPORT PLATE WELDED TO UNDERSIDE OF SINKS.
- t. WIDTH AS SPECIFIED.



SECTION A-A

- a. DUCT-18 GA. S/S WITH (3) 1" x 4" LOUVERS DIE STAMPED INWARD TO ALLOW FLOW OF COOL AIR FROM DISHWASHER. DUCT TO FIT TIGHT TO INSIDE OF VENT. SECURE WITH S/S SCREWS AND SEAL WITH SILICONE.
- b. CEILING TRIM-18 GA. S/S, 1" x 2" ANGLE TRIM SECURED TO DUCT WITH SILICONE. PERIMETER CRIMPED TO PROVIDE A HUG-TIGHT EDGE TO CLG.

h. VERIFY. DUCTS OVER 60" SHALL BE CROSS CREASED FOR RIGIDITY.

i. ~~§~~ w. i. DISHWASHER EXHAUST REQUIREMENTS. INCREASE DISHWASHER MANUFACTURERS CFM EXHAUST REQUIREMENTS FOR EACH VENT BY 50% TO ALLOW FOR AIR INDUCTION THROUGH DUCT VENTS.

c. EXHAUST DAMPER REQUIREMENTS. WHEN D.W. VENTS ARE NOT EQUIPPED WITH DAMPERS, EACH DUCT SHALL BE PROVIDED WITH AN 18 GA. S/S DAMPER AND LOCKING QUADRANT LOCATED BETWEEN THE LOUVERS AND D.W. VENT.

(END OF SECTION 114000)

SECTION 11 5213 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Front projection screen assemblies.

1.2 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Wiring diagrams for motor operators and actuators, and controls and switches.
- B. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.
- B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.
- C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

1.6 FIELD CONDITIONS

- A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

1.7 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

- B. Provide 5 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.1 FRONT PROJECTION SCREENS

- A. Manufacturers:
 - 1. Da-Lite Screen Company; Large Cosmopolitan Electrol: www.da-lite.com/#sle.
 - 2. Draper, Inc (Motorized); Premier XL: www.draperinc.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Front Projection Screens: Factory assembled unless otherwise indicated.
 - 1. In Cafeteria: Motorized, matte light diffusing fabric screen, wall mounted.
 - a. Screen Dimensions: 100 inch high x 160 inch wide.
- C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
 - 1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
 - 2. Seams: No seams permitted in fabric up to 96 inch high by 72 inch wide.
- D. Masking Borders: Black, on four sides.
- E. Exposed Screen Cases: Steel, with integral roller brackets.
 - 1. Finish: Baked enamel.
 - 2. Color: Black.
 - 3. End Caps: Steel; finished to match case.
 - 4. Mounting: Wall.
- F. Electrically-Operated Screens:
 - 1. Roller: Steel, 2 inch in diameter, with locking device.
 - 2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
 - 3. Horizontal Tensioning: As required by screen manufacturer.
- G. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.2 ELECTRICAL COMPONENTS

- A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.
- B. Motors: Direct drive, 110 V, 60 Hz.
 - 1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.
 - a. Electrical Characteristics: 1.2 amps.
 - b. Motor mounted on sound absorber.
- C. Controls: Key-operated Switch.
 - 1. Security: Provide key operated switch; provide 2 keys. Provide Best core.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is finished and ready to accept screen installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify type and location of electrical connections.
- D. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.2 PREPARATION

- A. Coordinate screen installation with installation of projection systems.
- B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install screens in mountings as specified and as indicated on drawings.
- D. Install plumb and level.
- E. Install electrically operated screens ready for connection to power and control systems by others.
- F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
- G. Test electrical screens for proper working condition. Adjust as needed.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 5413 - KILNS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electric kilns.
- B. Downdraft ventilation system.
- C. Accessories.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts for kilns, ventilation systems, and accessories.
- B. Shop Drawings: Include plans for kilns indicating space required and relationship to work of other sections.
- C. Operating and Maintenance Data: Provide manufacturer's operation and maintenance instructions for kilns and ventilation systems
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
 - 1. Source Limitations: Obtain kilns, ventilation systems, and accessories through one (1) source from a single manufacturer. Kiln and ventilation system to be UL listed as a system.
- B. Regulatory Requirements: Comply with provisions of the following product certifications:
 - 1. NFPA: Provide kilns and ventilation systems listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. UL and NEMA: Provide electrical components required as part of kilns and ventilation systems that are listed and labeled by UL and that comply with applicable NEMA standards.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver kilns, ventilation systems, and accessories in manufacturer's original packaging with protective covering intact.
- B. Do not stack other items on top of packaged kilns during transportation and storage. Stack kilns with top end up.
- C. Utilize equipment capable of moving the kiln and packaging without damage and install kilns into location.
- D. Protect from damage due to weather, excessive temperature, and construction operations.

1.5 WARRANTY

- A. Provide 2 year manufacturer warranty for kilns.
- B. Special Warranties: Manufacturer's standard form in which manufacturer of each kiln specified agrees to repair or replace kilns that fail in materials or workmanship within specified warranty period. Warranty includes labor for repair or replacement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Skutt Kilns; KMT-1027: www.skutt.com/.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ELECTRIC KILNS

- A. Electric Kilns: Manufacturer's 10-sided electric kiln with components, options, and accessories needed to comply with requirements and provide complete functional kilns including the following components.
 - 1. Kiln stand.
 - 2. Fire brick.
 - 3. Kiln elements.
 - 4. Ring latch.
 - 5. Chest handle.
 - 6. Lid with lifter and latch.
 - 7. Control box.
 - 8. Thermocouple.
 - 9. Controller touch pad.
 - 10. Peep plugs.
- B. Factory pre-wire kilns for electrical switching devices and computer interface system. Factory predrill holes in the kiln lid and floor for the downdraft ventilation system.

2.3 DOWNDRAFT VENTILATION SYSTEM

- A. Downdraft Ventilation System: Negative pressure downdraft ventilation system; capable of removing hazardous fumes only, not heat. System to consist of the following components:
 - 1. Blower motor with six (6) ft. power cord and in-line switch.
 - 2. 8 x 12 inch mounting plate.
 - 3. Eight (8) ft. x three (3) inch flexible aluminum duct.
 - 4. Spring-loaded plenum cup assembly.
 - 5. Blower inlet tube.
 - 6. Blower discharge tube.
 - 7. Plenum spring.
 - 8. Three (3) to four (4) inch connector.
 - 9. Floor mounting plate.
 - 10. Mounting hardware.
- B. System fits a single top-loading, multi-sided, electric kiln with a chamber size less than 12 cu. ft. Provide a dual intake kit to vent a single kiln over 12 cu. ft. or two (2) kilns with chamber

volumes each under 12 cu. ft. Maximum chamber volume that can be vented with one (1) motor is 24 cu. ft.

- C. Electrical Switching Device: Electrical switching device utilizing a programmable power output in the controller to turn the downdraft ventilation system on and off.

2.4 ACCESSORIES

- A. Angled Touchpad Mount: Angled Touchpad; permits easy viewing and programming of kiln controls.
- B. Computer Interface System (CIS): Computer interface system including required software and hardware to connect a computer to the kiln controller.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where kilns, ventilation systems, and accessories will be installed, for compliance with manufacturer requirements for installation tolerances. Notify the Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Downdraft Ventilation System:
 - 1. Ensure that kiln stand is a minimum of eight (8) inches high. If stand is lower than eight (8) inches high, either shim legs to increase distance from floor to eight (8) inches or replace stand with one (1) that is eight (8) inches high.
 - 2. If kiln does not have factory drilled holes, provide number, size of holes as recommended by the manufacturer for the specific kiln model. Locate holes in accordance with manufacturer's recommendations.

3.3 INSTALLATION

- A. Install in strict accordance with manufacturer's written installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances.
- B. Install units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Set units level, plumb, properly aligned, and securely in place.
- D. See Division 26 sections for electrical requirements.
- E. Downdraft Ventilation System:
 - 1. Assemble and install system components on kiln in accordance with manufacturer's written instructions.
 - 2. Install the blower and motor assembly on the wall in a location that is close enough for the flexible aluminum duct to reach the kiln without overstretching the duct. Where wall-mounting is not possible, mount the vent motor on the floor or above the ceiling.

3.4 CLEANING AND PROTECTION

- A. Test kilns, ventilation systems, and accessories to verify proper operation. Make necessary adjustments.
- B. Verify that accessories required have been furnished and installed.
- C. Remove packing material and leave kilns in clean condition, ready for operation.

END OF SECTION

SECTION 11 6143 - STAGE CURTAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stage curtain fabrics.
- B. Linings.
- C. Stage curtain track support systems.

1.2 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. FM (AG) - FM Approval Guide.
- C. ITS (DIR) - Directory of Listed Products.
- D. NFPA 70 - National Electrical Code.
- E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- F. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Provide for each type of product as follows:
 - 1. Stage Curtains: Provide information on type of curtain, weight, location for use on project, and type of flame retardancy.
 - 2. Tracks: Provide capacity of each curtain track to support curtain weight and control curtain operation.
- B. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.
 - 1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
 - 2. Submit fabric assembly and support details.
 - 3. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
 - 4. Submit attachment locations for proscenium curtain, and corresponding loads imposed on structure.
 - 5. Submit locations of equipment components, switches, and controls; identify between manufacturer installed and field installed wiring.
 - 6. Submit wiring diagrams for power, signal, and control wiring.
- C. Selection Samples: Submit color chart for each type of stage curtain indicated that includes full range of colors, textures, and patterns available, along with 12 inch square fabric sample, in any color, of each fabric type and seam.

- D. Verification Samples: Submit fabric full width by at least 12 inch long section of each selected fabric from dye lot to be used for this work, with specified treatments applied and showing repeat of patterns; mark top and face of fabric.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Delegated Design Data: Indicate stage curtain system structural attachments, including analysis data signed and sealed by qualified designer responsible for their preparation.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. Extra Stock Materials: 10 square yards of each kind of fabric provided for project.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design of track support system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.5 FIELD CONDITIONS

- A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
 - 1. Wet work in adjacent areas is complete and surfaces are dry.
 - 2. Work at and above ceiling level has been completed.
 - 3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.
- B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.6 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
 - 1. Defective Work includes, but is not limited to, stage curtain support and rigging that is not operating properly.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Stage Curtain Fabrics:
 - 1. Beck Studios Inc: www.beckstudios.net/#sle.

2. Fred Krieger & Company: www.fredkriegerfabrics.com/#sle.
 3. LuXout Stage Curtains: www.luxout.com/#sle.
- B. Stage Curtain Track Systems:
1. Beck Studios Inc: www.beckstudios.net/#sle.
 2. Fred Krieger & Company: www.fredkriegerfabrics.com/#sle.
 3. LuXout Stage Curtains: www.luxout.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

- A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.
- B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
1. Design Loads: Weight of stage curtains and track system.
- C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.
1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:
 - a. Inherently Flame Retardant (IFR), fibers/yarns that are non-combustible for life of fabric.
 2. Permanently attach swatch of matching fabric from same dye lot, at least 12 inch square, to backside of curtain assembly for use as fire-resistance test strip.
- D. Electrical Components: Devices that are listed and labeled in compliance with NFPA 70, by a qualified testing agency, and marked for designated application.

2.3 STAGE CURTAIN FABRICS

- A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.
- B. Doral Opaque - Repp Fabric: Weighing at least 21 ounces/linear yard, woven fabric of 35 percent modacrylic, 35 percent rayon, and 30 percent saran, with vinyl backing and 48 inch minimum width.
1. Application: Procenium curtain.
 2. Color: As selected by Architect from manufacturer's full range.
 3. Texture: As selected by Architect from manufacturer's full range.
 4. Pattern: As selected by Architect from manufacturer's full range.

2.4 LININGS

- A. Light-Weight Polyester Lining: Weighing at least 10 ounces/linear yard, 100 percent polyester fabric; 72 inch minimum width.
1. Color: Black.

2.5 CURTAIN TRACK

- A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.
 - 1. Thickness: As recommended by manufacturer for curtain loads and operation.
 - a. Heavy-Duty: 14 gage, 0.0747 inch minimum thickness.
- B. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.
- C. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.
- D. Track-Lap Clamp: Clamp that matches track channel finish as necessary for attaching two tracks at center overlap.
- E. Folding Guide: Carriers, as indicated on drawings, with rear-fold or backpack guide and rubber spacers to fold curtain from offstage end of curtain; size for use with operating line as required.
- F. Operation:
 - 1. Manual Cord Operation: Curtain track with cord, pulleys, and floor pulley; must manually open and close the curtain.
 - a. Operating Line: 3/8 inch diameter, stretch-resistant operating cord with braided synthetic-fiber cover over solid, synthetic-fiber, linear filaments.
 - b. End Pulleys: One single dead-end and one double live-end pulley, with sheaves having shielded ball bearings housed in plated-steel covers that match track finish, and provide with bracket for securing off-stage end of curtain.
 - c. Floor Pulleys: Sheave, adjustable type with 3 inch (76 mm) diameter wheels, and having shielded ball bearings housed in plated-steel covers, painted black.
- G. Track System: Provide heavy-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.
 - 1. Carriers: Standard plated-steel carriers with a pair of nylon tired ball-bearing wheels riveted parallel to body, and equip carriers with rubber or neoprene bumpers to reduce noise and plated-steel swivel eye and trim chain for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.
 - a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier.
 - 2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with molded-nylon-tired ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.6 FABRICATION - CURTAINS

- A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.
 - 1. Facing the full width of material at center meeting edges.
 - 2. Curtains that are tabled square, and hems that don't pucker.
 - 3. 1-1/2 inch clearance from floor at bottom of curtain.
 - 4. Curtains are 24 inch longer than clear height of valance opening.

5. Curtains that overlap 36 inch at the center.
 6. Curtains that extend 24 inch on each side beyond full width of proscenium opening.
- B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:
1. Vertical Hems: Fabricate at least 2 inch wide, and at least 4 inch wide at borders, valances, teasers, and tormentors with at least 1 inch tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
 2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inch of face fabric, with at least 1 inch tuck, and vertically secured by sewing.
 3. Top Hems: Fabricate by double-stitching 3-1/2 inch wide, heavy jute or laminated synthetic webbing to top edge at back side of curtain with at least 2 inch of face fabric turned under.
- C. Fullness:
1. 50 Percent Fullness: Provide this fullness, exclusive of turnbacks and hems, and spaced at 12 inch on center along top hem reinforcement as follows:
- D. Grommets:
1. Black Colored Curtains: No. 3 brass, No. 4 brass, or aluminum grommets with black finish.
 2. Flat Curtains: No. 3 brass blind grommet top finish to mask battens using hidden pairs of grommets at 12 inch on center and 1 inch from corner of curtain; for ties.
- E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:
1. For Curtains With Fullness:
 - a. Curtains That Don't Hang to Floor: Hems at least 3 inch deep, with weight tape, 3/4 inch, and open ends of hems sewn closed.
 2. Lining: Provide lining for curtain with matching fullness of face fabric and finished 2 inch shorter than face fabric, and sew or otherwise securely fasten lining to top hem of face fabric.
 - a. Attach lining to face fabric along bottom and side seams with 4 inch long strips of heavy woven cotton tape.
 - b. Sew lining to bottom edge of curtain to provide sufficient lining fabric for tucking and to accommodate for shrinkage.

2.7 ACCESSORIES

- A. Battens: Fabricate using steel pipe and minimize the number of joints; connect pipe at joints using 18 inch long internal splice sleeve secured with four flush rivets, plug welds, threaded couplings, or equally strong method.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.
- B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.3 INSTALLATION - CURTAIN

- A. Track Hung: Secure curtains to track carriers with S-hooks.

3.4 INSTALLATION - BATTENS

- A. Install battens by suspending at heights as indicated with trim and supports spaced as required to support loads; do not exceed 10 feet between supports.

3.5 INSTALLATION - TRACK

- A. Mounting of Track Assembly:
 - 1. Beam Mounted: Install track by suspending from beam clamps securely mounted to structural I-beam and within intervals indicated in manufacturer's written instructions for on center spacing.
- B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
 - 1. Heavy-Duty Track: 6 feet, maximum.
- C. Install track for center-parting curtains with at least 24 inch overlap of track sections at center-line, and supported with track lap clamps.

3.6 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Demonstrate proper operation of equipment to Owner's designated representative.

3.7 PROTECTION

- A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

END OF SECTION

SECTION 11 6623 - GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basketball backboards, goals, and support framing.
- B. Gymnasium exercise equipment.
- C. Floor sleeves for net and goal posts.
- D. Wall mounted protection pads.
- E. Gym divider curtains.
- F. Volleyball nets and posts.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- C. NFPA 101 - Life Safety Code.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Fire rating certifications.
 - 2. Structural steel welder certifications.
 - 3. Manufacturer's installation instructions.
- B. Erection Drawings: Detailed dimensional requirements for proper location of equipment.
- C. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors and textures.
- D. Operating and maintenance data, for each operating equipment item.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Gymnasium Equipment:
 - 1. Draper, Inc: www.draperinc.com/#sle.
 - 2. IPI by Bison, Inc: www.ipibybison.com/#sle.
 - 3. Performance Sports Systems: www.perfsports.com/#sle.

2.2 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
 - 1. National Federation of State High School Associations (NFHS) sports rules.
- C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of contract documents.
- D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- E. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.3 DIVIDER CURTAINS

- A. Gymnasium Divider Curtains:
 - 1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester meeting NFPA 101.
 - a. Upper Section: 9 oz/sq yd vinyl mesh fabric.
 - 1) Color: White.
 - b. Lower Section: 18 oz/sq yd solid vinyl coated polyester.
 - 1) Color: As selected from manufacturer's full line.

2. Operation: Vertical lift roll-up, curtain coils on top rail.
3. Controls: Keyed wall switch; provide Best core..

2.4 BASKETBALL

- A. Basketball System: Backstop assembly, backboard, and goal.
- B. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
 1. Framing: Center strut; forward folding framing.
 2. Folding Control System: Manual winch with safety catch and automatic reset.
 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 4. Height Control System: Manual winch.
 5. Framing Color: Manufacturer's standard.
- C. Backboards: Tempered Glass (main goals) and Steel (side goals), rectangular shaped.
 1. Frame: Brushed aluminum edge, steel mounting.
 2. Markings: Painted.
 3. Provide safety padding for bottom edge of backboard.
 4. Color: As selected from manufacturer's standard selection.
- D. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
 1. Net Attachment Device: Tube-tie.
 2. Finish: Powder coat orange.

2.5 FLOOR-MOUNTED EQUIPMENT

- A. Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
 1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
 2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
 3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
 4. Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
- B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
 1. Latch Cover: Chrome plated, round; tamper resistant lock with key.
 2. Sleeve: Aluminum.
 3. Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.

2.6 EXERCISE EQUIPMENT

- A. Chinning Bar: Wall mounted steel bar, parallel to floor; adjustable for height.
 1. Bar Diameter: 1 inch.
 2. Steel Bar Finish: Zinc-plated.
 3. Steel Frame Finish: Powder coating, color as selected from manufacturer's full line.
- B. Traverse Climbing Wall: Modular climbing wall with mat-locking system.
 1. Section Dimensions: 96 inches high by 48 inches long.
 2. Overall Dimensions: 96 inches high by 480 inches (40 feet) long.
 3. Mat-Locking System: Vinyl-coated urethane foam.

- a. Size: 72 inches high by 480 inches (40 feet) long.
- b. Thickness: 2 inches.
- c. Hardware: Manufacturer's standard.
- d. Color: As selected from manufacturer's full range.
- 4. Manufacturers:
 - a. Everlast Climbing, a Playcore Company; Chroma Climbing Wall: www.everlastclimbing.com/.
 - b. Spectrum Sports International; Modular Climbing Panels: www.spectrumports.com/.

2.7 WALL PADDING

- A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
 - 1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
 - 2. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
 - a. Color: As selected from manufacturer's standard range.
 - b. Texture: Embossed leather-look.
 - c. Fabric Weight: 14 oz/sq yd.
 - 3. Foam: Urethane, soft, 3.5 pcf nominal density.
 - 4. Foam: Open cell polychloroprene (Neoprene) 5.5 pcf nominal density.
 - 5. Foam Thickness: 1-1/2 inches.
 - 6. Backing Board: Plywood.
 - 7. Mounting: Removable; Z-clips fixed to wall and to padding.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.

3.2 INSTALLATION

- A. Install in accordance with contract documents and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

- F. Separate dissimilar metals to prevent electrolytic corrosion.

3.3 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.4 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.5 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 6813 - PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete footings for playground equipment.
- B. Playground equipment.

1.2 DEFINITIONS

- A. Play Event: A piece of playground equipment that supports one or more play activities.
- B. Use Zone: Area under and around a play event within which the ground surfacing must meet fall impact attenuation requirements of ASTM F1292 when tested at the fall height specified for the play event.
- C. Fall Height: Vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it, as defined in ASTM F1487.
- D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.
- E. Subgrade: Surface of the ground on which the protective surfacing is installed; the subbase for the protective surfacing is installed over the subgrade.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
- H. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

- I. AWPB U1 - Use Category System: User Specification for Treated Wood.
- J. CPSC Pub. No. 325 - Public Playground Safety Handbook.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.
 - 1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
 - 2. Include representatives of Contractor.
 - 3. Notify Architect at least 2 weeks prior to meeting.

1.5 SUBMITTALS

- A. Product Data: For manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.
 - 1. Certifications: Provide International Play Equipment Manufacturers Association (IPEMA) certification that product complies with ASTM F1487, excluding section 10 and 12.6.1.
- B. Product Data: For fabricated items, provide the following:
 - 1. Galvanized Steel: Certification of galvanized coating thickness.
- C. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.
 - 1. Show locations and dimensions of footings and anchorage points.
 - 2. Clearly identify mounting elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing.
 - 3. Show locations of underground utilities, storm drainage system and irrigation system.
 - 4. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
- D. Samples: For each item that a color must be selected, provide color chart showing full range of colors and finishes.
- E. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.
- B. Installer Qualifications: Company certified by manufacturer for training and experience installing play events and equipment.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

- B. Store materials in a dry, covered area, elevated above grade.

1.8 WARRANTY

- A. Provide minimum 10 year warranty for playground equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Playground Equipment:
 - 1. GameTime, Inc: www.gametime.com/#sle.
 - 2. MaxPlayFit: www.maxplayfit.com/.
 - 3. Playground Specialists, Inc.: www.playspec.com/.
 - 4. Taylor Sports and Recreation: www.miracle-recreation.com/.

2.2 PLAYGROUND EQUIPMENT - GENERAL

- A. Design Assumptions: Because the safety of the playground depends on strict conformance to the design criteria, this information is provided for Contractor's information.
 - 1. Playground has been designed for children ages 5 through 12.
 - 2. Separate areas for different age groups are indicated on drawings.
 - 3. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.
- B. Mount equipment on concrete footings, unless otherwise indicated.
 - 1. Protective Surfacing Depth: Refer to Section 32 1816.13.
 - 2. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must conform to specified requirements for equipment.
 - 3. Paint portion of support that is intended to be installed below top surface of protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.
- C. Provide permanent label for each equipment item stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

2.3 PLAYGROUND EQUIPMENT

- A. Conform to ASTM F1487 and CPSC Pub. No. 325; provide equipment conforming to specific requirements for relevant age group(s).
 - 1. Provide components having factory-drilled holes; do not use components with extra holes that will not be filled by hardware or covered by other components.
- B. Slides: Slide bed, ship's ladder with handrails, and platform.
 - 1. Slide Bed: Rigid, molded ultraviolet stabilized polyethylene, with anti-static additives, segmented enclosed tube construction.
 - 2. Treads and Handrails: Galvanized steel with stringers of galvanized steel.
 - 3. Fall Height - Ages Two to Five: 30 inches, maximum.
 - 4. Fall Height - Ages Five to Twelve: 48 inches, maximum.
 - 5. Width: 14 inches.

6. Maximum Slope: 30 degrees.
7. Supports and Platform: Galvanized steel with powder coating.
8. Color: As selected from manufacturer's standard color palette.
9. Certification: Provide International Play Equipment Manufacturers Association (IPEMA) certification that indicates product complies with ASTM F1487, excluding sections 7.1.1, 10, and 12.6.1.

C. Freestanding Climbers:

1. Certification: Provide International Play Equipment Manufacturers Association (IPEMA) certification that indicates product complies with ASTM F1487, excluding sections 7.1.1, 10, and 12.6.1.

2.4 CUSTOM PLAY STRUCTURES

- A. Materials, Configuration, and Dimensions: To resemble Robinia Series, "Parkour" structures by Kompan.
- B. Fabricate in accordance with ASTM F1487, unless otherwise indicated; in particular, requirements for sharp points and edges, protrusions, entanglement hazards, crush and shear points, and head and neck entrapment.
- C. Sliding Poles: Hot-dipped galvanized steel pipe, 1-5/8 inch diameter, maximum; continuous surface with no protruding welds or joints along the sliding area.
- D. Flexible Climber: Flexible grid of ropes to provide access to an elevated platform; anchored at both ends; ground anchor below bottom of protective surfacing.

2.5 MATERIALS

- A. Steel Pipe and Tube: Conforms to ASTM A135/A135M, ASTM A500/A500M, or ASTM A513/A513M; hot-dipped galvanized and free of excess weld and spatter.
 1. Tensile Strength: 45,000 psi, minimum.
 2. Yield Point: 33,000 psi, minimum.
 3. Galvanizing: Hot-dip metal components in zinc after fabrication, in accordance with ASTM A123/A123M; remove tailings and sharp protrusions and burnish edges.
- B. Extruded Aluminum: ASTM B221 or ASTM B221M, Alloy 6061, 6062, or 6063.
 1. Tensile Strength: 39,000 psi, minimum.
 2. Yield Point: 36,500 psi, minimum.
- C. Rope Cable: Strands of steel cable with UV-stabilized polypropylene synthetic covering; ends capped to prevent fraying.
- D. Hardware: Provide without hazardous protrusions, corners, or finishes, and that require tools for removal after installation; countersunk fasteners are preferred.
 1. Use stainless steel for metal-to-metal connections; select type to minimize galvanic corrosion of materials connected by hardware.
 2. Use stainless steel for wood-to-wood and wood-to-metal connections.
 3. Use stainless steel with plastic components.
 4. Bearings: Self lubricating.
 5. Hooks, Including S-Hooks: Closed loop; maximum gap 0.04 inches, less than the thickness of a dime.
 6. Rails, Loops, and Hand Bars: Same metal as item is mounted on or aluminum; with powder coating.

- 7. Anchors: In accordance with manufacturer's recommendations.
- E. Boards and Timbers: Free of holes, cracks, and loose knots; do not use wood or wood coatings that contain pesticides; do not utilize used lumber.
 - 1. Preservative Treatment: Pressure type in accordance with AWWA U1 Use Category 4A Commodity B; do not use chromated copper arsenate (CCA), creosote, pentachlorophenol, tributyl tin oxide, or any other treatment prohibited by law; treat cuts after fabrication using brushed-on preservative.
- F. Powder Coating for Steel: Electrostatically applied and oven cured polyester powder over electrostatic zinc coating.
- G. Concrete: As specified in Section 03 3000.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify location of underground utilities and facilities in playground area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.2 PREPARATION

- A. Stake location of playground elements, including Use Zone perimeters, perimeter of protective surfacing, access and egress points, hard surfaces, walls, fences, and structures, and planting locations.
- B. Stake layout of entire Use Zone perimeter before starting any work and before subbase under resilient surfacing is laid.
 - 1. Verify that Use Zone perimeters do not overlap hard surfaces, whether currently installed or not.
 - 2. Verify that Use Zones are free of obstructions that would extend into resilient portion of protective surfacing.
 - 3. If conflicts or obstructions exist, notify Architect.
 - 4. Do not proceed until revised drawings have been provided, showing corrected layout, and obstructions have been removed.

3.3 INSTALLATION

- A. Coordinate work with preparation for and installation of protective surfacing specified in Section 32 1816.13; install resilient portion of protective surfacing after playground equipment installation.
- B. Install concrete footings with top surface a minimum of 1/2 inch below required subgrade elevation.
- C. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).
- D. Anchor equipment securely below bottom elevation of resilient surfacing layer.
- E. Install without sharp points, edges or protrusions, entanglement hazards, pinch, crush, or shear points.

- F. Do not modify play events on site without written approval of manufacturer.
- G. Install required signage if not factory-installed.

3.4 FIELD QUALITY CONTROL

- A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.
- B. Owner or Owner's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.
- C. Repair or replace rejected work until compliance is achieved.

3.5 CLEANING

- A. Restore adjacent existing areas that have been damaged from the construction.
- B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation; clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.
- C. Clean playground area of excess construction materials, debris, and waste.
- D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

3.6 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 2113 - HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.2 REFERENCE STANDARDS

- A. WCMA A100.1 - Safety of Window Covering Products.

1.3 SUBMITTALS

- A. Product Data: Provide data indicating physical and dimensional characteristics and operating features.
- B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Blind Assemblies: One of each size.
 - 2. Extra Slats: 20 of each type and size.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 BLINDS

- A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
- B. Locations: Provide at doors and sidelites identified by Owner.
- C. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
- D. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
 - 1. Width: 1 inch.
 - 2. Color: As selected by Architect.
- E. Slat Support: Woven polypropylene cord, ladder configuration.
- F. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
 - 1. Color: Same as slats.

- G. Bottom Rail: Pre-finished, formed aluminum; with end caps.
 - 1. Color: Same as headrail.
- H. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
- I. Control Wand: Extruded hollow plastic; hexagonal shape.
 - 1. Color: Clear.
- J. Headrail Attachment: Wall brackets.
- K. Accessory Hardware: Type recommended by blind manufacturer.

2.2 FABRICATION

- A. Determine sizes by field measurement.
- B. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch.
- C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings are ready to receive the work.

3.2 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

3.3 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- B. Maximum Offset From Level: 1/8 inch.

3.4 ADJUSTING

- A. Adjust blinds for smooth operation.

3.5 CLEANING

- A. Clean blind surfaces just prior to occupancy.
- B. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 12 2400 - WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Window shades and accessories.

1.2 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details and mounting dimension requirements for each product and condition.
- C. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- D. Selection Samples: Include fabric samples in full range of available colors and patterns.
- E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience.

1.6 MOCK-UP

- A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.

1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
2. Full-sized mock-up may become part of the final installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 1. Shade Hardware: 10 years.
 2. Fabric: One year.
 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 1. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
 2. Levolor: www.levolor.com/commercial/#sle.
 3. MechoShade Systems, LLC: www.mechoshade.com/.
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 WINDOW SHADE APPLICATIONS

- A. Interior Roller Shades: Sheer shades.
 1. Type: Roll down, closed position is at window sill.
 2. Fabric Performance Requirements:
 - a. Openness Factor: 3%.
 3. Color: As selected by Architect from manufacturer's full range of colors.
 4. Mounting: Inside (between jams).
 5. Operation: Manual.

2.3 ROLLER SHADES

- A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
 1. Drop: Regular roll.
 2. Size: As indicated on drawings.
- B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Sheer Shades: Reduce glare yet still reveal considerable details to the outside; no privacy; Openness Factor greater than 1 percent.
 2. Flammability: Pass NFPA 701 large and small tests.
- C. Roller Tubes: As required for type of operation.
1. Material: Extruded aluminum or galvanized steel; as required for shade location.
 2. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
 3. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 4. Finish: Baked enamel; color from manufacturer's standards.
- D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
1. Style: Half wrap fabric covered bottom bar, flat profile with closed ends.
 2. Finish: Baked enamel.
 3. Color: As selected from manufacturer's standard colors.
- E. Manual Operation for Interior Shades: Clutch operated continuous loop; beaded ball chain.

2.4 ACCESSORIES

- A. Fascias: Size as required to conceal shade mounting.
1. Style: As selected by Architect from shade manufacturer's full selection.
- B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.
- C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.5 FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

- C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Installation Tolerances:
 - 1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
 - 2. Maximum Offset From Level: 1/16 inch.
- C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.
- C. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.5 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.6 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3200 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured Standard casework, with cabinet hardware.
- B. Special purpose units.

1.2 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.3 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- D. BHMA A156.9 - American National Standard for Cabinet Hardware.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Keying Conference: Conduct conference with FCPS Lock Shop prior to ordering keys. Incorporate conference decisions into keying submittal.

1.5 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- B. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**

2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.**
 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For composite wood and plastic finishes provide Material Ingredient Report.**
 4. **EQ Credit 2: Low-Emitting Materials**
 - a. **For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**
- C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 6 inches by 6 inches.
1. Plastic laminate samples, for color, texture, and finish selection.
- E. Manufacturer's Installation Instructions.
- F. Installer's Qualification Statement.
- G. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
1. See Section 01 6000 - Product Requirements, for additional provisions.
- I. Finish touch-up kit for each type and color of materials provided.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 2. This AWI (QCP) project is registered as project number _____.
 3. Provide designated labels on shop drawings as required by certification program.
 4. Provide designated labels on installed products as required by certification program.
 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 6. Replace, repair, or rework all work for which certification is refused.

- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
 - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
 - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.8 MOCK-UP

- A. Provide full size base cabinet and upper cabinet complete with drawers, door, adjustable shelf and countertop.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.9 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Delamination of components.
 - 5. Failure of adhesives.
 - 6. Failure of hardware.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Plastic Laminate Casework:
 - 1. TMI Systems Corporation: www.tmisystems.com/.
- B. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.2 CASEWORK, GENERAL

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom Grade.

2.3 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Structural Performance: Safely support the following minimum loads:
 - 1. Base Units: 500 pounds per linear foot across the cabinet ends.
 - 2. Suspended Units: 300 pounds static load.
 - 3. Drawers: 125 pounds, minimum.
 - 4. Hanging Wall Cases: 300 pounds.
 - 5. Shelves: 100 pounds, minimum.
- D. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
- E. Hardware Application: Factory-machine casework members for hardware that is not surface applied.
- F. Removable back panels on all base cabinets. Provide partial height back panels at sink cabinets.
- G. Fixed panels at backs of open spaces between base cabinets.
 - 1. Provide cutouts for power and data receptacles where indicated on drawings.
- H. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- I. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
- J. Apron Frames: Construction similar to other cabinets, with modifications.
- K. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

2.4 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.
 - 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 - 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 - a. Base Cabinets: 24 inches.

- b. Tall Cabinets: 24 inches.
 - c. Wall Cabinets: 13 inches.
- 3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As selected by Architect from manufacturer's custom line.
 - c. Cap exposed plastic laminate finish edges with plastic trim.

2.5 COUNTERTOPS

- A. Countertops: As specified in Section 12 3600.

2.6 SPECIAL PURPOSE UNITS

- A. Library Special Units.
 - 1. Basis of Design Manufacturer: ICI Scientific (formerly CampbellRhea): www.iciscientific.com/.
 - 2. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 - 3. Primary Construction: Plastic-laminate clad units.
 - a. Finish, Surface Color and Pattern: As indicated on drawings.
 - 4. Single-Sided Shelving Units: Manufacturer's standard starter and add-on units.
 - a. Sizes and configurations indicated on drawings.
 - b. Shelves: Adjustable, in 1 inch increments.
- B. Musical Instrument Storage Special Units.
 - 1. Basis of Design Manufacturer: Wenger: <https://www.wengercorp.com/>.
 - 2. Style: Flush Inset, Type A. Ease doors and drawer fronts slightly at edges.
 - 3. Primary Construction: Plastic-laminate clad units.
 - a. Finish, Surface Color and Pattern: As indicated on drawings.
 - 4. Large and Small Instrument Storage Units: Manufacturer's standard; sizes and configurations indicated on drawings.
- C. Mailroom Special Units.
 - 1. Basis of Design Manufacturer: WB Manufacturing LLC: www.wibenchmfg.com/.
 - 2. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 - 3. Primary Construction: Plastic-laminate clad units, with plastic laminate countertops.
 - a. Finish, Surface Color and Pattern: As indicated on drawings.
 - 4. Mail Slot Units: Manufacturer's standard units; sizes and configurations indicated on drawings.

2.7 CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes, and as indicated below.
- B. Conform to BHMA A156.9 requirements.
- C. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
 - 1. Hinged Doors: Cam type lock, satin chromium plated over nickel on base material.
 - 2. Tall Hinged Doors: Three-point latching system.
 - 3. Keying: Key locks alike within a space; key each room separately.
 - 4. Master Key System: All locks operable by master key.
- D. Shelves in Cabinets:

1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- E. Swinging Doors: Hinges, pulls, and catches.
1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
 - a. Concealed Hinges: Installed in cabinet edge, and on door back, satin chromium plated over nickel on base material.
 - 1) European-Style Hinges for Overlay Doors: 110 degree opening angle.
 2. Pulls: Chrome wire pulls, 4 inches wide.
 - a. Pull design to conform to project's referenced accessibility requirements.
 3. Catches: Magnetic.
- F. Drawers: Pulls and slides.
1. Pulls: Chrome wire pulls, 4 inches wide.
 - a. Pull design to conform to project's referenced accessibility requirements.
 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.8 MATERIALS

- A. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants as specified in Section 01 6116.
- B. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
 2. **Sustainable Design Requirements:**
 - a. **Forest Certification: Provide wood products made from forests certified by an FSC accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.**
 - b. **Compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**
 - c. **Composite Wood:**
 - 1) **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2) **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**
- C. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.
- D. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.

2.9 ACCESSORIES

- A. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: As selected by Architect from manufacturer's custom range.
 2. Use at exposed edges.

- B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- C. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.
- D. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

PART 3 EXECUTION

3.1 PREPARATION

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.2 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
 - 1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
 - 2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- D. Verify adequacy of support framing and anchors.
- E. Verify that service connections are correctly located and of proper characteristics.

3.3 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.

- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.
- G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.
- H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- I. Install hardware uniformly and precisely.
- J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- K. Replace units that are damaged, including those that have damaged finishes.

3.4 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.5 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean casework and other installed surfaces thoroughly.

3.6 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.
- C. Wall-hung counters and vanity tops.
- D. Window sills.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.
- F. PS 1 - Structural Plywood.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- C. **LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements - LEED v4/v4.1.**
 - 1. **MR Credit 2: BPDO - Environmental Product Declarations**
 - a. **For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2. **MR Credit 3: BPDO - Sourcing of Raw Materials**
 - a. **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**
 - b. **For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.**
 - 3. **MR Credit 4: BPDO - Material Ingredients**
 - a. **For composite wood and plastic finishes provide Material Ingredient Report.**

4. **EQ Credit 2: Low-Emitting Materials**

- a. **For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**

- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.4 **QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 2. Provide designated labels on shop drawings as required by certification program.
 3. Provide designated labels on installed products as required by certification program.
 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 **FIELD CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 **COUNTERTOPS AND WINDOW SILLS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.

1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 - a. Manufacturers:
 - 1) Formica Corporation: www.formica.com/#sle.
 - 2) Panolam Industries International, Inc. Pionite: www.pionitelaminates.com.
 - 3) Wilsonart: www.wilsonart.com/#sle.
 - b. Finish: Matte or suede, gloss rating of 5 to 20.
 - c. Surface Color and Pattern: As selected by Architect from the manufacturer's custom line.
 2. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
 - a. Color: As selected by Architect from the manufacturer's custom line.
 3. Back and End Splashes: Same material, same construction.
 4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.
- C. Solid Surfacing Countertops and Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
 - 2) Dupont: www.corian.com/#sle.
 - 3) Formica Corporation: www.formica.com/#sle.
 - 4) Wilsonart: www.wilsonart.com/#sle.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As selected by Architect from manufacturer's custom line.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 5. Provide brackets and braces as required and as indicated on drawings.
 6. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

- A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.
 2. **Sustainable Design Requirements:**
 - a. **Forest Certification:** Provide wood products made from forests certified by an FSC accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.
 - b. **Compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.**
 - c. **Composite Wood:**
 - 1) **Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.**
 - 2) **For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.**

- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 1/2 inch thick; join lengths using metal splines.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.3 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and window sills up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

- C. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

- A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 4813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Extruded aluminum entrance floor grilles.
- B. Carpet mat.
- C. Recessed mat frames.

1.2 SUBMITTALS

- A. Product Data: Provide data indicating properties of walk-off surface, component dimensions.
- B. Shop Drawings: Indicate dimensions and details for recessed frame.
 - 1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.
- C. Samples: Submit two samples, 8 by 8 inch in size illustrating pattern, color, finish, and edging.
- D. Maintenance Data: Include cleaning instructions, and stain removal procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Entrance Floor Grilles and Gratings:
 - 1. Activar Construction Products Group - JL Industries; Activ-Grate 600 Series: www.activarcpg.com/#sle.
 - 2. Babcock-Davis; envIRONtread II Rigid Grille: www.babcockdavis.com/#sle.
 - 3. Nystrom, Inc; envIRONtread II Rigid Grille: www.nystrom.com/#sle.
- B. Floor Mats:
 - 1. American Floor Products Company, Inc: www.afco-usa.com/#sle.
 - 2. R.C. Musson Rubber Co: www.mussonrubber.com/#sle.
 - 3. AMARCO Products: www.amarcoproducts.com/.

2.2 ENTRANCE FLOOR GRILLES AND GRATINGS

- A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
 - 1. Recess Depth: 3/4 inches.
 - 2. Colors: To be selected by Architect from manufacturer's custom selection.
 - 3. Length in Direction of Traffic Flow: 120 inches, minimum.
 - 4. Width Perpendicular to Traffic Flow: Full width of entrance door opening, unless indicated otherwise.
 - 5. Frame: Anodized aluminum for embedding in concrete; minimal exposed trim; stud or hook concrete anchors.
 - 6. Pan: Anodized aluminum bottom pan with drain, sealed to frame.

- 7. Location: As indicated on the drawings.
- B. Mounting: Top of non-resilient members level with adjacent floor.
- C. Structural Capacity: Capable of supporting a rolling load of 500 pounds without permanent deformation or noticeable deflection.
- D. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.3 MATS

- A. Carpet Mat: Cut nylon pile permanently bonded to rubber backing; 78 inch wide by 48 inch long with one inch black matching rubber border on all edges.
 - 1. Colors: To be selected by Architect from manufacturer's custom range.
 - 2. Location: Provide at all doors to exterior from spaces with finished floors, unless indicated otherwise.

2.4 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
- B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

- A. Mats: Verify size of floor recess before fabricating mats.
- B. Vacuum clean floor recess.

3.3 INSTALLATION

- A. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

- A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 12 5000 - CLASSROOM AND OFFICE FURNITURE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Classroom and office furniture including the following:
 - 1. STEM Lab Tables.
 - 2. STEM Lab Stools.

1.2 REFERENCES

- A. GREENGUARD Environmental Institute (GEI):
 - 1. GREENGUARD certified low emitting products.
- B. US Green Building Council (USGBC):
 - 1. Leadership in Energy and Environmental Design (LEED) Green Building Rating System.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Verification Samples: For each finish product specified, two samples, representing actual product and finish.
- C. LEED Submittals:
 - 1. Credit EQ 4.4: Manufacturer's certificate indicating that composite wood products and adhesives used in casework with no urea formaldehyde added.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years of experience in manufacture of similar products in use in similar environments.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle casework in accordance with manufacturer's recommendations. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept casework and recommended temperature and humidity levels will be maintained during the remainder of construction.

1.6 WARRANTY

- A. Warranty: Manufacturer's written warranty indicating manufacturer's intent to repair or replace components of music education storage casework that fail in materials or workmanship within 10 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:
 - 1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.
 - 2. Delamination or other failures of glue bond of components.

3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.

PART 2 PRODUCTS

2.1 STEM LAB TABLE

A. MANUFACTURERS

1. MityBilt Products, Inc.: www.mitybilt.com
2. Fleetwood Design Studio: www.fleetwoodfurniture.com
3. Alumni Classroom Furniture, Inc.: www.alumnicf.com

B. MATERIALS

1. Frame
 - a. 16 gauge steel frame.
 - b. Adjustable height 30"-42"
 - c. 2" diameter legs
 - d. Non-removable full-swivel locking castors
 - e. Finish: Powder coat
 - f. Color: Architect to select from Manufacturer's full range.
2. Top
 - a. 1 3/4"TH Maple "butcher block" top
 - 1) Nominal 4/4 rails
 - 2) Face-glued
 - b. Dimensions: 36"W x 60"L
 - c. Edge Profile: 1/8" radius
 - d. Finish: Clear catalyzed lacquer

2.2 STEM LAB STOOL

A. MANUFACTURERS

1. MityBilt Products, Inc.: www.mitybilt.com
2. Fleetwood Design Studio: www.fleetwoodfurniture.com
3. Alumni Classroom Furniture, Inc.: www.alumnicf.com

B. MATERIALS

1. Adjustable height 20"-30"
 - a. Pneumatic/Gas-lift.
2. One-piece molded plastic seat
 - a. Concealed seat attachments
3. 360 degree swivel with adjustable foot ring
4. 5-star base with glides

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction. Test for proper operation and adjust until satisfactory results are obtained.

3.4 CLEANING AND PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Clean surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

END OF SECTION

SECTION 12 5600 - SPECIALIZED STORAGE SYSTEMS

PART 1 GENERAL

1.1 SCOPE

- A. It is the purpose of this specification to establish requirements for mobile storage systems and to provide the owner with a durable and functional product. The construction methods of joinery, material and material thickness shall be in accordance with the standards set forth herein.
- B. Equipment installation shall include coordination, delivery, receiving, set up "complete" and final cleaning. Immediately notify manufacturer's agent in the event of any damaged product, take photographs and document specific details such as type of product, specific location and shipping information. Remove from inventory if damage creates safety concerns of the end user.
- C. Take necessary precautions to protect finish of other product and repair or make arrangements for the repair or replacement of all installation damage as required to a like new condition.
- D. If applicable, check and verify all conditions and dimensions at project location prior to installation and notify owner of any irregularities prior of installation.
- E. In the event of supplied materials to Furniture, Cabinetry or Millwork subcontractor, it shall be the subcontractor's responsibility to coordinate the exact installation requirements at the time of shop drawings. Additionally, subcontractor shall provide a mockup of finished product to insure guide rails and trays operate successfully.
- F. It shall be the intent of these specifications to provide a single source "system" of components that permits the end users to simply and effectively manage the smallest of components to the largest storage needs. The "system", as indicated below, is comprised of tote trays, lids and inserts as well as carts of various sizes and capacities to a series of wall storage units that can be seen as a repository of all educational resources. This "system" has been fully designed with the intent that all components can be integrated in endless configurations for unlimited tasks and needs.

1.2 RELATED WORK

- A. Furniture, cabinetry and or Millwork subcontractor shall coordinate guide rail and tray installation if necessary.

1.3 SUBMITTALS

- A. Shop drawings, if required, shall be submitted in accordance with applicable requirements of section 01 3300 within 30 days execution of Owner-Contractor agreement. Drawings shall consist of specific product details including but not limited to all dimensions, thickness and tolerances required for the exact coordination into existing cabinetry.
- B. Templates shall be provided only upon request of subcontractor.
- C. Provide physical product samples for each type only if necessary for coordination into subcontractor's work.

1.4 PRODUCT HANDLING

- A. Protect all equipment during transit, delivery, storage and handling to prevent damage and soiling. Manufacture shall provide all protective wrappings.
- B. If required, store products at project site in pre-installation storage areas with similar ambient conditions as final installation or in off-site solutions as required by manufacturer.

1.5 WARRANTY

- A. Manufacturer shall warranty ALL products manufactured by it to be free of defects and material workmanship when properly installed under normal use for a period of three (3) years from the date of substantial completion.
- B. Manufacture shall additionally provide a limited-lifetime warranty for all components constructed from HIPS, High Impact Polystyrene. Warranty shall specifically detail shatterproof characteristics resulting from BS: 5873 (1998) Part 4 for an impact drop test or approved equal. Components constructed from ABS, Acrylonitrile Butadiene Styrene shall additionally be provided with a limited lifetime warranty.

PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on the StorSystem™ line of products as manufactured by Certwood, Limited, Luton, England. Products and catalog number contained within this guide specification are used as a basis of identification, configuration, size and quality.
- B. Products shall be supplied to the North American markets from a warehouse facility in Wintersville, Ohio.
- C. Comparable units, modified if so required, to be in compliance with these specifications by meeting or exceeding these specifications, by MityBilt Products Inc, Stonewall, Manitoba, Canada will be considered equal if deemed acceptable upon review of the substitution review process.

2.2 DESIGN

- A. Provide a system of integrated, modular storage components that can be simply and easily combined to create a 3-tiered holistic approach to storage that is mobile as well as customizable and reduces the footprint over traditional storage solutions.

2.3 MATERIAL AND CONSTRUCTION

- A. Hips, High Impact Polystyrene.
 - 1. Shatterproof solid color Tote Trays, and Inserts shall be constructed from HIPS, High Impact Polystyrene passing the standards of BS: 5873 (1998) PART 4 for an impact drop test. More specifically products must be able to withstand a bull nosed steel weight equaling 1.25kg (2.75lbs) dropped from a height of 1.5 meters (5 ft.), remaining intact and unbroken after ten consecutive drop tests.
 - a. Primary Solid "standard" color options shall be Cool Gray.
 - b. Pastel solid "special" color options shall be Pastel Blue and Pastel Green.

- c. "Special" colors are defined as colors that need to be requested by the manufacturer for pricing and delivery structures.
 2. Products manufactured from Talc Filled Polypropylene will not be deemed acceptable unless bearing test results from standard BS: 5873 (1998) part 4 for an impact drop test.
- B. Super Tuff ABS, Acrylonitrile Butadiene Styrene
1. "Shatterproof" Crystal Line Tote Trays, lids and Rails shall be constructed from Super Tuff ABS, Acrylonitrile Butadiene Styrene.
 - a. Crystal line "standard" color options shall be Crystal Clear and Tinted Blue.
 2. Translucent products manufactured from Talc Filled Polypropylene will not be deemed acceptable.
- C. Tote Trays:
1. Slim Line" Standard Width (SW) 12" by 16 ¾" deep wide tote trays shall be available in depths of 3" (single-depth), 6" (double-depth), 9" (triple-depth) and 12" (quad-depth) specifically designed to be used in conjunction with the Glide & Tilt® Tote Tray Runner System, tote tray inserts and are available with optional crystal clear, see through lids.
 2. "Wide Line" Extra Wide (EW) 18 ½" wide by 16 ¾" deep tote trays shall be available in depths of 3" and 6" specifically designed to be used in conjunction with the Glide & Tilt® Tote Tray Runner System and are available with optional crystal clear, see through lids.
 3. Internal, rectangular area of trays shall be free of obstructions to maximize storage area and shall permit the nesting of optional tote tray inserts with or without the optional lids.
 4. Tote trays shall be completely manufactured with internal radius corners, no less than a radius of 3/16" or 5.5 mm for "ease of cleaning" in the most stringent sanitary environments. Products manufactured with corners less than a radius of 3/16" or 5.5 mm will not be deemed acceptable.
 5. Tote trays shall be reversible within the Glide & Tilt® Tote Tray Runner System permitting the tray to be inserted in any direction.
 6. Tote trays shall be stackable with the use of optional lids. Bottom of tote tray shall nest securely within the lid of the lower tote tray, prohibiting the tote trays to slide when transporting in a stacked configuration.
 7. Tote trays shall be designed with a dual labeling system, one on each end. "Front" system shall be provided with a removable translucent ticket window providing the option to utilize an internal label or external writable surface. "Rear" labeling system or "E-Z Peel" area shall be designed and manufactured no less than 2" high x 8 ¼" wide with stipples no less than .004" above the face of the tote tray providing a surface to easily apply and remove larger sticky labels.
- D. Runners:
1. Tote tray runners shall be utilized for all mobile and fixed storage solutions and shall be the patented Glide & Tilt® Tray Runner System with integrated "Arrestor & Tilt" feature. Arrestor and Tilt holds the tray in an angled open position making easy access and clear display of the tray contents. Systems that do not permit full access to tray contents while within the storage component will not be deemed acceptable.
 2. The "Shatterproof" tote tray structural runners shall be molded from Acrylonitrile Butadiene Styrene (ABS) Plastic and be provided in single and triple module options.
 3. Runners shall be available for either metal or wood construction.
 - a. Structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to the steel frames with 1/4" tap screws. Color shall be Light Gray or Crystal clear.
 - b. Runners specifically designed for wood construction shall be manufactured with tab inserts to inset into predrilled vertical cabinet faces. Runners shall be secured to the wood frames with ¼" wood screws. Color shall be Crystal Clear.

4. Runner system shall be designed to permit any combination of tote tray depths for a specific width. Runners with protruding catch mechanisms that prohibit use of a variety of tote tray heights will be deemed unacceptable.
5. The Glide & Tilt® Structural Runner, available as a Triple or Single module, shall be designed as a structural element for use with metal frames.

E. Carts:

1. Mobile Series

- a. Mobile series fully welded metal cart frames shall be constructed from 16 ga. baked-on epoxy powder coated; 1" square steel tubing. Structural tote tray runners are securely anchored to the steel frames with 1/4" tap screws.
- b. Top panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
- c. "Optional" side and rear panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
- d. Product coatings are specifically designed to resist wear, abrasion, corrosion and chemicals and offer the ability of the panels to be utilized as a dry erase surface.
- e. Glide & Tilt® structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to the steel frames with 1/4" tap screws.
- f. Mobile series metal cart frames shall be provided with (4) 3-inch heavy-duty swivel casters with, stainless steel bumper and sealed internal ball bearings to provide ease of movement. Casters shall be provided with friction fitted coated steel frame inserts.
- g. Depths of all units shall be 18" "out to out." This dimension incorporates an additional 1/2" projection for widest projection of the caster bumper for design purposes. The actual physical dimension of the upper frame assembly is 17".
- h. Mobile series carts shall be offered with six (6) "Slim line" size options in two heights: 29 1/4" high units shall be provided in 6, 12 and 18 modules for the various tote tray combinations, 40 3/4" high units shall be provided in 9, 18 and 27 modules for the various tote tray combinations.
- i. Frame and panel colors shall be White or Light Gray.
- j. Cart Schedule:
 - 1) Double Column Mobile Cart
 - (a) 29 1/2"W x 29 1/4"H x 18"D
 - (b) 12 slim line tray module spaces
 - (c) 4 single-depth slim line trays
 - (d) 4 double-depth slim line trays
 - (e) Basis-of-Design: StorSystem CE2101 - Swift Cart
 - 2) STEM Lab/Makerspace Mobile Cart
 - (a) 42 1/2"W x 38 3/8"H x 25"D
 - (b) Adjustable open shelving
 - (c) Magnetic peg-board back/sides
 - (d) 18 slim line tray module spaces
 - (e) 6 single-depth slim line trays
 - (f) 6 double-depth slim line trays
 - (g) Basis-of-Design: StorSystem CE2500 Innov-8

2. Traditional Series

- a. Cabinet construction shall be a nominal 3/4" high performance melamine faced chipboard "MCF." All units shall be constructed from one-piece panels.
- b. All panels shall be edge banded with high performance high impact resistance PVC edging.

- c. Panels shall be joined with a fluted dowel pin construction. Panels shall be assembled under controlled case clamp conditions assuring final cabinet squareness and proper joint compression.
- d. Glide & Tilt® Tote runners specifically designed for wood construction shall be manufactured with fluted tab inserts to inset into predrilled vertical cabinet faces. Side panels shall be precision bored to receive fluted runner tabs. Runners shall be secured to the wood frames with ¼" wood screws.
- e. Cabinet boxes are available in pearwood finish. See specific component specification for color options.

F. Wall Units:

- 1. Fully welded, metal wall unit frames shall be constructed from 16ga. baked-on epoxy powder coated; 1" square welded steel tubing. Structural tote tray runners are securely anchored to the steel frames with ¼ tap screws.
- 2. Top panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
- 3. Glide & Tilt® Tote structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to the steel frames with 1/4" tap screws.
- 4. Wall units shall be offered with six (2) "Slim line" size options in two heights: 75 ¼" high units shall be provided in 36 and 54 modules for the various tote tray combinations.
- 5. All wall units are provided with four (4) coated steel metal frame connectors, 4 frame caps and 4 adjustable feet.
- 6. Wall units shall be anchored to an adjacent wall surface utilizing manufacturer's standard steel angle clips for additional support.
 - a. When attached to gypsum board and stud wall assembly, wood blocking shall be provided in the wall for attachment of clips.
- 7. Frame and panel colors shall be White or Light Gray.
- 8. Wall Unit Schedule:
 - a. Double Column Wall Unit
 - 1) 28 3/4"W x 75 1/4"H x 18"D
 - 2) 36 tray module spaces
 - 3) 20 single-depth slim line trays
 - 4) 8 double-depth slim line trays
 - 5) Basis-of-Design: StorSystem CE2090
 - b. Triple Column Wall Unit
 - 1) 42 1/2"W x 75 1/4"H x 18"D
 - 2) 54 tray module spaces
 - 3) 54 single-depth slim line trays
 - 4) Basis-of-Design: StorSystem CE2091
 - c. Triple Column Wall Unit
 - 1) 42 1/2"W x 75 1/4"H x 18"D
 - 2) 54 tray module spaces
 - 3) 30 single-depth slim line trays
 - 4) 12 double-depth slim line trays
 - 5) Basis-of-Design StorSystem CE2091

G. Accessories:

- 1. Lids:
 - a. Optional "shatterproof" lids shall be manufactured from Super Tuff ABS, Acrylonitrile Butadiene Styrene.
 - b. Lids shall nest within the top of either the slim line or wide line tote trays creating a seamless horizontal cover, which provides resistance to contamination of the tote trays contents.

- c. Lids shall permit stacking of several tote trays as well as resist accidental falls due to sliding by an integral nesting system. The top face of the lids shall be designed and manufactured to nest a tote tray no less than 7/32" while still providing a ventilation space below the nested tote tray by use of a series a of eight (8), 7/8" long raised tabs.
 - d. Lids shall be removable from the tote tray while in the tilted position of the patented Glide & Tilt® Structural Runner system.
 - 2. Ticket Windows:
 - a. Optional ticket windows shall be manufactured from random copolymer polypropylene. Ticket windows shall be 1 3/8" high x 4 1/2" wide and securely snap onto the face of the tote tray.
 - b. Ticket windows shall be designed and manufactured to not inhibit the function of the systems other attributes.
 - c. Ticket windows permit the placement of paper labels within the created enclosed area.
 - 3. Inserts:
 - a. Optional modular tote tray inserts shall be manufactured from HIPS, High Impact Polystyrene.
 - b. Inserts shall be 11 1/4" wide x 7 3/4" high x 2 1/2" deep
 - c. Inserts shall be available in 5 different internal configurations (note: dimensions provided are top of compartment)
 - 1) CE4004, Single Division Stortray
 - (a) (1) 7 1/4" x 10 5/8" compartment
 - 2) CE4000, 2 Division Stortray
 - (a) (2) 7 1/4" x 5 1/4" compartments
 - 3) CE4001, 3 Division Short Compartment Stortray
 - (a) (2) 3 3/8" x 5 1/4" and (1) 7 1/4" x 5 1/4" compartment
 - 4) CE4002, 3 Division Long Compartment Stortray
 - (a) (2) 3 3/8" x 5 1/4" & (1) 3 3/8" x 10 5/8" compartment
 - 5) CE4003, 4 Division Stortray
 - (a) (4) 3 3/8" x 5 1/4" compartments
 - d. Inserts shall be designed and manufactured to nest within the slim line tote trays and not inhibit the function of the systems other attributes. Insets sit on the bottom of the 3" tote trays and on an internal guide rail of the 6", 9" and 12" slim line tote trays. The internal guide rail permits the inserts to glide across top of the tote tray while permitting storage beneath the inserts undisturbed.
 - 4. Filing Frame:
 - a. Optional steel wire filing frame specifically designed for legal sizes files can be provided to be inserted into the 9" or 12" high tote trays enabling products to be designed as an alternative to file cabinets.
- H. Testing and Certifications:
- 1. In addition to above testing certifications, StorSystem products shall meet or exceed the following:
 - 2. StorSystem with Glide & Tilt® Tote Tray Runner System manufactured by Certwood have undergone extensive testing for ergonomics, structural and safety requirements of the appropriate British and European standards and FIRA specifications.
 - 3. Certification confirming the StorSystem Glide & Tilt® Panel Tray Runners CE0010. CE0011 manufactured by Certwood Unlimited has been tested at FIRA International Limited and successfully satisfied the selected test requirements from: BS 5873 - 4: 1998 Test Level H (Selected Tests)
 - 4. Certification confirming StorSystem Storage Tote Trays and Lids (CE1950 SW Single Depth tray, CE1952 SW Double Depth tray, CE1954 SW Quad Depth tray, CE1956 EW Single Depth tray, CE1958 SW Double Depth tray, CE1960CL SW Lid, CE1970CL EW

Lid) and StorSystem Glide & Tilt Tray Runners (CE0002. CE0003. CE0004. CE0005. CE0006.) Supplied by Certwood Unlimited has been tested at FIRA International Limited and successfully satisfied the selected test requirements from: BS 5873 - 4: 1998 Test Level H (Selected Tests)

5. Greenguard and Greenguard Gold certified.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation must be performed by manufacturer's authorized representative.
- B. All installations shall be performed in a craftsman like manner. Metal, Tall Storage units shall be installed, level and plumb, securely attached to building with anchorage devices of appropriate type, size and quantity to meet all applicable national, regional and local codes, rules and regulations as well as all printed installation guidelines, specifications and safety requirements. Secure wall units to adjacent structures will applicable clips and anchorage systems to support 300 pounds of weight supported from face of unit.
- C. Inspect and properly adjust all new equipment. If applicable, repair metal scratches with factory provided touch up paint. Remove, recycle and dispose of all packing and wrapping materials off site.
- D. Warranty:
 1. Limited lifetime warranty.

END OF SECTION

SECTION 14 2400 - HYDRAULIC ELEVATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Complete hydraulic elevator systems.
 - 1. Passenger type.
- B. Elevator Maintenance Contract.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- D. AISC 360 - Specification for Structural Steel Buildings.
- E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- G. ASME A17.1 - Safety Code for Elevators and Escalators.
- H. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- K. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- M. NEMA LD 3 - High-Pressure Decorative Laminates.
- N. NEMA MG 1 - Motors and Generators.
- O. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- P. NFPA 70 - National Electrical Code.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- R. PS 1 - Structural Plywood.
- S. UL (DIR) - Online Certifications Directory.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
 - a. Elevator equipment devices remote from elevator machine room or hoistway.
 - b. Elevator pit for lighting and sump pump.
 - c. Fire alarm panel from controller cabinet.
 - 2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
 - a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
- B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
 - 1. Review schedule of installation, proper procedures and conditions, and coordination with related work.
- C. Construction Use of Elevator: Not permitted.

1.4 SUBMITTALS

- A. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car design, dimensions, layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- B. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
 - 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - 4. Individual weight of principal components; load reaction at points of support.
 - 5. Clearances and over-travel of car.
 - 6. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
 - 7. Location and sizes of hoistway and car doors and frames.
 - 8. Calculated heat dissipation of elevator equipment in machine room.
 - 9. Applicable seismic design data; certified by a licensed Professional Structural Engineer.
 - 10. Interface with building security system.
 - 11. Electrical characteristics and connection requirements.
 - 12. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- C. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of finish color selection brochures or physical samples.
- D. Designer's Qualification Statement.

- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Testing Agency's Qualification Statement.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Initial Maintenance Contract.
- J. Maintenance Contract: Submit proposal to Owner for standard two year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
 - 1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.
- K. Operation and Maintenance Data:
 - 1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 - 2. Operation and maintenance manual.
 - 3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of each quality standard document on site.
- B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section and approved by elevator equipment manufacturer.
- E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.6 WARRANTY

- A. Provide manufacturer's warranty for elevator operating equipment and devices for two years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hydraulic Elevators:
 - 1. Schindler Elevator Corporation; 330A: www.schindler.com/#sle.
 - 2. ThyssenKrupp Elevator; endura MRL: www.thyssenkruppelevator.com/#sle.
- B. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier .

2.2 HYDRAULIC ELEVATORS

- A. Hydraulic Passenger Elevator:
 - 1. Hydraulic Elevator Equipment:
 - a. Holeless hydraulic with cylinder mounted within hoistway.
 - 2. Drive System:
 - a. Variable voltage variable frequency (VVVF) to modulate motor speed.
 - 3. Operation Control Type:
 - a. Selective Collective Automatic Operation Control.
 - 4. Service Control Type:
 - a. Standard service control only.
 - 5. Interior Car Height: 96 inch.
 - 6. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
 - 7. Rated Net Capacity: 3000 pounds.
 - 8. Rated Speed: 100 feet per minute.
 - 9. Hoistway Size: As indicated on drawings.
 - 10. Interior Car Platform Size: As indicated on drawings.
 - 11. Elevator Pit Depth: 48 inch.
 - 12. Overhead Clearance at Top Floor: 144 inch.
 - 13. Travel Distance: As indicated on drawings.
 - 14. Number of Stops: 3.
 - 15. Number of Openings: 3 Front.
 - 16. Hydraulic Equipment Location: As indicated on drawings

2.3 COMPONENTS

- A. Elevator Equipment:
 - 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Conform to NFPA 70.
 - 2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
 - 3. Buffers:
 - a. Spring type for elevators with speed less than or equal to 200 feet per minute.
 - 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.
 - b. Grease Cups: Automatic feed type.
 - c. Lubrication Points: Visible and easily accessible.
- B. Electrical Equipment:

1. Motors: NEMA MG 1.
2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70.
3. Sump Pump in Pit: Refer to Section 22 1429.
4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
5. Include wiring and connections to elevator devices remote from hoistway and between elevator machine room. Provide additional components and wiring to suit machine room layout.

2.4 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Conform to ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Conform to ADA Standards.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
- D. Conform to seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
 1. Conform to Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
 2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.
- E. Perform welding of steel in accordance with AWS D1.1/D1.1M.
- F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.
- G. Perform electrical work in accordance with NFPA 70.
- H. Conform to venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction.
- I. Conform to fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction. Refer to Section 21 1300.

2.5 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels and landing indicator panels.
 1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 2. Landing Indicator Panels: Illuminating.
 3. Conform to ADA Standards for elevator controls.
- B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.
- C. Door Operation Controls:
 1. Program door control to open doors automatically when car arrives at floor landing.
 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

- D. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
 - 1. Designated Landing: At first floor.

2.6 OPERATION CONTROL TYPE

- A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
 - 1. Refer to description provided in ASME A17.1.
 - 2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
 - 3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
 - 4. All "UP" landing calls are made when car is traveling in the up direction.
 - 5. All "DOWN" landing calls are made when car is traveling in the down direction.
 - 6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.

2.7 SERVICE CONTROL TYPE

- A. Restricted Access Service Control:
 - 1. Car Call Security Lock-out: Provide a security card activated switch in car operating panel that performs the following when activated:
 - a. Restricts or permits registration of a specific landing button.
 - b. Landing calls are answered in normal manner.
 - 2. Allow "Firefighter's Emergency Operation" to take control priority over "Restricted Access Service Control".

2.8 EMERGENCY POWER

- A. Set-up elevator operation to run with building emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.
- B. Building Emergency Power Supply: Supplied by backup generator; provide elevator system components as required for emergency power characteristics with phase rotation the same as for normal power.
 - 1. Provide transfer switches and auxiliary contacts.
 - 2. Install connections to power feeders.
- C. Emergency Lighting: Conform to ASME A17.1 elevator lighting requirements.
- D. Provide operational control circuitry for adapting the change from normal to emergency power.
- E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.9 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.
- B. Plywood: PS 1, Structural I, Grade C-D or better, sanded.

- C. Tempered Glass: 3/8 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.
- D. Resilient Flooring: Vinyl tile flooring, as specified in Section 09 6500.
- E. Plastic Laminate: NEMA LD 3, Type HGS, color as selected by Architect from manufacturer's standard line of colors.

2.10 CAR AND HOISTWAY ENTRANCES

- A. Elevator, all locations:
 - 1. Car and Hoistway Entrances:
 - a. Hoistway Fire Rating: As indicated on drawings.
 - b. Framed Opening Finish and Material: As indicated on drawings.
 - c. Car Door Material: Powder coat on steel, with rigid sandwich panel construction.
 - d. Hoistway Door Material: Powder coat on steel, with rigid sandwich panel construction.
 - e. Door Type: Double leaf.
 - f. Door Operation: Center opening, single speed.
 - g. Paint Color: As selected by Architect from manufacturer's standard line.
 - h. Sills: Extruded aluminum.
- B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.
- C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to eliminate audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car:
 - 1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, and alarm button.
 - a. Panel Material: Integral with front return; one per car.
 - b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.
 - d. Provide matching service cabinet integral with front return panel, with hinged door and keyed lock in each car.
 - e. Provide following within service cabinet as part of car operating panel:
 - 1) Switch for each auxiliary operational control, keyed.
 - 2) Emergency light.
 - 3) Telephone cabinet and hard-wired connection with telephone.
 - 2. Flooring: Resilient vinyl tile.
 - 3. Front Return Panel: Match material of car door.
 - 4. Door Wall: Plastic laminate on plywood.
 - 5. Side Walls: Plastic laminate on plywood.
 - 6. Rear Wall: Plastic laminate on plywood.
 - 7. Hand Rail: Aluminum, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
 - a. Aluminum Finish: Clear anodized.
 - 8. Ceiling:

- a. Exposed Frame Suspended Ceiling: Plastic laminate on plywood, mount 7 inch below car canopy with 1-1/2 inch nominal space between edge of ceiling and wall.
 - b. Frame Finish: Color anodized aluminum.
 - c. Lighting: As selected from manufacturer's standard line.
- B. Car Accessories:
 - 1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.

2.12 MACHINE ROOM FITTINGS

- A. Wall-Mounted Frames: Glazed with clear plastic; sized as required. Provide one chart each for master electric and hydraulic schematic and for lubrication chart. Install charts.
- B. Key Cabinet: Wall-mounted, lockable, keyed to building keying system, for control and operating panel keys.
 - 1. Provide two key cabinet keys.
 - 2. Provide two control/operating panel keys.
 - 3. Provide two card access keys.

2.13 FINISHES

- A. Powder Coat on Steel: Clean and degrease metal surface; apply one coat of primer; two coats of powder coat.
- B. Clear Anodized Finish: Class I, AAMA 611 AA-M12C22A41 Clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils, 0.0007 inch thick.
- C. Color Anodized Finish: Class I, AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils, 0.0007 inch thick.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.2 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components, and conform to requirements of Section 01 5000 - Temporary Facilities and Controls.
- B. Maintain elevator pit excavation free of water.

3.3 INSTALLATION

- A. Coordinate this work with installation of hoistway wall construction.
- B. Install system components, and connect equipment to building utilities.
- C. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 26 0533.13 and 26 0583.
- D. Install hydraulic piping between cylinder and pump unit.
- E. Mount machines, motors, and pumps on vibration and acoustic isolators.
 - 1. Place on structural supports and bearing plates.
 - 2. Securely fasten to building supports.
 - 3. Prevent lateral displacement.
- F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.
- H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- I. Bolt brackets to self drilling expansion shell anchors.
- J. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.
- K. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- L. Fill hoistway door frames solid with grout in accordance with Section 04 2000.
- M. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- N. Machine Room Components: Clean and degrease; prime one coat, finish with one coat of enamel.
- O. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- P. Adjust equipment for smooth and quiet operation.

3.4 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.5 FIELD QUALITY CONTROL

- A. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1 will be performed at their discretion.
 - 1. Schedule tests with agencies and notify Owner and Architect.
 - 2. Obtain permits as required to perform tests.
 - 3. Document regulatory agency tests and inspections in accordance with requirements.
 - 4. Perform tests required by regulatory agencies.
 - 5. Furnish test and approval certificates issued by authorities having jurisdiction.
- B. Operational Tests:
 - 1. Perform operational tests in the presence of Owner and Architect.
 - 2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
 - a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.
 - 3. Set period of time elevator takes to travel between typical floor landings at not more than 10 seconds.
 - a. Measure time from moment doors start to close until car has stopped level at next floor landing and doors are opening.

3.6 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.7 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components in accordance with manufacturers written instructions.
- C. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

3.8 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, cleaning and maintenance of each component.
- C. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Manufacturer's training personnel.
 - 4. Location: At project site, unless noted otherwise.

3.9 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

- A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 3 months from Date of Substantial Completion.
- B. Submit proposal for continuation of Maintenance Contract in accordance with ASME A17.1 and requirements as indicated for installed elevator equipment.
- C. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.
- D. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.
- E. Examine system components periodically.
- F. Include systematic examination, adjustment, and lubrication of elevator equipment.
- G. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.
- H. Perform work without removing cars from use during peak traffic periods.
- I. Provide emergency call back service during regular working hours throughout period of this maintenance contract.
- J. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION