



PROJECT MANUAL
FOR
URBANA ELEMENTARY
SCHOOL



2

BID SET
January 10, 2019

VOLUME 2 OF 4
DIVISION 1 THROUGH 14

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SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

- A. Project Name: Urbana Elementary School; Frederick, Maryland.
- B. Owner's Name: Frederick County Public Schools.
- C. The Project consists of the replacement of the existing Urbana Elementary School.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: Multiple prime contracts each based on a Stipulated Price as described in the Agreement.

1.3 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.

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. 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.

1.5 COORDINATION

- A. Web-based Project Management Software:
 - 1. RFIs, project submittals and contractor change proposals will be submitted, managed and responded to through a web-based solution for construction administration.
 - 2. The Owner and Architect have selected Procore as the web-based solution for this Project. Contact Procore for additional information on the service.
 - 3. Procore will provide a training session via web conference.
 - 4. Additional PDF mark-up software may be required for electronic processing.
 - 5. Provide a project record CD or DVD containing all data managed through the web-based project management software, at the conclusion of the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.2 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- D. Submit Schedule of Values in duplicate within 10 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.
 - 1. Identify site mobilization and bonds and insurance.
 - 2. Include additional line items identified by subsection titles, for Work exceeding \$15,000.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.3 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Present required information in typewritten form.
- E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed .
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- I. Submit three copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Transmittal letter as specified for Submittals in Section 01 30 00.
 - 2. Construction progress schedule, revised and current as specified in Section 01 32 16.
 - 3. Current construction photographs specified in Section 01 30 00.

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4. Partial release of liens from major Subcontractors and vendors.
 5. LEED submittals applicable to work for which application is being made.
- K. When Architect 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.
- L. Clearly indicate on the Application for Payment those line items which include materials or equipment, purchased or fabricated and stored, but not yet installed.
1. Differentiate between items stored on-site and items stored off-site.
 2. Payments for material and equipment stored off-site will be at the sole discretion of the Owner. If required, Contractor will be responsible for all costs of travel and lodging for Architect, Engineers, and Owner to off-site storage locations to examine these items and the conditions of storage.
 3. For items stored off-site, provide a bill of sale from supplier/Trade Contractors and certificates of insurance for the full value of stored materials with the Owner named as the insured.
 4. For items stored off-site show a separate line item for the value of delivering and unloading the items at the Project site.
 5. For items stored on or off-site, provide in a separate line item for the value of the installation of these items.
- M. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Staff names and assignments.
 3. Schedule of Values.
 4. Contractor's Construction Schedule (preliminary if not final).
 5. Products list.
 6. Schedule of unit prices.
 7. Submittals Schedule (preliminary if not final).
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Certificates of insurance and insurance policies.
 12. Performance and payment bonds.
 13. Data needed to acquire Owner's insurance.
 14. Preliminary LEED Building Product Disclosure and Optimization (BPDO) Calculator, Construction and Demolition Waste Management Plan and Indoor Air Quality Plan.
- N. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 3. Completion of LEED Online documentation.

1.4 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
- B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
- C. 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.
- D. 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 7 days.
- E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation .
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

- I. 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.
- J. Promptly enter changes in Project Record Documents.

1.5 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 70 00, Section 01 77 00 and Section 01 78 00.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 6. AIA Document G707, "Consent of Surety to Final Payment."
 - 7. Evidence that claims have been settled.
 - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 9. Final, liquidated damages settlement statement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00 - ALTERNATE BIDS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Administrative and procedural requirements for Alternate Bids.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
 2. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate. Include costs of related coordination, modification, or adjustment.

1.3 ACCEPTANCE OF ALTERNATE BIDS

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

1.4 SCHEDULE OF ALTERNATE BIDS

- A. Alternate Bid No. 1 - Solid Surfacing Counter Tops at Wet Areas:
1. Base Bid Item: Provide plastic laminate countertops at Countertop types C1 and C2 at casework/millwork locations as noted on the Countertop Schedule. Countertop C3 to be solid surfacing as base bid. Countertop C4 to be Epoxy Resin as base bid. All storefront sills are to be solid surfacing quartz as base bid. Media Center circulation desk to be Metal Flake Acrylic surfacing as base bid.
 2. Alternate Bid Item: Provide solid surfacing countertops as specified in Section 12 36 00, paragraph 2.1B at all Countertop type C1 locations.
- B. Alternate Bid No. 2 - Decorative Display Panels:
1. Base Bid Item: Provide no decorative display panels.
 2. Alternate bid Item: Provide decorative semi-rigid wall coverings with custom graphics where indicated and as specified in Section 10 26 00.
- C. Alternate Bid No. 3 - Media Center Stair:
1. Base Bid Item: Provide two-story volume as shown at Media Center.
 2. Alternate Bid Item: Provide open stair connecting second floor to first floor in the Media Center. Alternate to include all appurtenances associated with the stair including, but not limited to the stair, railings, landing structure, opening B020, and all finishes directly required for the stair. These finishes shall be equal to the finishes required for Stairs 1 through 4 in the base bid.
- D. Alternate Bid No. 4 - Energy Dashboard & Utility Meters as Required for LEED EAc5 (measurement & verification):

1. Base Bid Item: Provide no utility meters as required for LEED EAc5 (measurement & verification).
 2. Alternate Bid Item: Provide energy dashboard and utility meters as required for LEED EAc5 (measurement & verification), as indicated on drawing M-8.7.
- E. Alternate Bid No. 5 - Main Street / Cafeteria Flooring:
1. Base Bid Item: Provide flooring as noted on Finish Schedule Sheet A-3.1.
 2. Alternate Bid Item 5a: Provide 2 mm quartz tile flooring at all locations noted on Sheet A-3.1. The cost associated with this alternate shall be the difference between the base bid material and this alternate material only.
 3. Alternate Bid Item 5b: Provide 3/8" poured epoxy terrazzo at locations noted on Sheet A-3.1. The cost or credit associated with this alternate shall be the difference between the base bid material and this alternate material only.
- F. Alternate Bid No. 6 - Alternative Flooring at Remainder of the Building:
1. Base Bid Item: Provide flooring as noted on Finish Schedule Sheet A-3.1.
 2. Alternate Bid Item 6a: Provide 2 mm quartz tile flooring at all locations noted on Sheet A-3.1. The cost associated with this alternate shall be the difference between the base bid material and this alternate material only.
 3. Alternate Bid Item 6b: Provide 2.5 mm Luxury Vinyl Tile flooring at all locations noted on Sheet A-3.1. The cost associated with this alternate shall be the difference between the base bid material and this alternate material only.
- G. Alternate Bid No 7: - Increased Security Glazing at Entrances:
1. Base Bid Item: Provide glass types as shown on drawings
 2. Alternate Bid Item 7: Provide glass type G-2B at Hollow Metal Frame type 10, and glass type G-3 at SF9, SF23, SF25 and SF25B. Where glass type G-8 is required, type G-3 glass to include color 1.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Project coordination.
- C. Requests for interpretation (RFI).
- D. Subcontract list.
- E. Staff names and assignments.
- F. Progress photographs.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals, where required in addition to digital submission.
- I. Submittal procedures.
- J. Contractor's use of Architect's CAD files.
- K. Delegated design.
- L. Contractor's review.
- M. Architect's action.
- N. Daily construction reports.

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 truck 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. Closeout submittals.

1.3 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 - 3. Frivolous RFIs: The Contractor will compensate the Owner for the Architect's time and expenses to process RFIs resulting from the Contractor's lack of studying and comparing the Contract Documents, coordinating their own Work, or repeating previous RFIs.
 - 4. Submit RFIs through the Web-based Project Management Software, software creates PDF.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 - 1. Project name, date, Name of Contractor, Name of Architect and RFI number will be provided as part of the Web-based Project Management Software.
 - 2. Specification Section number and title and related paragraphs, as appropriate.
 - 3. Drawing number and detail references, as appropriate.
 - 4. Field dimensions and conditions, as appropriate.
 - 5. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 6. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Format of RFIs:
 - 1. Software-Generated RFIs:
 - a. Preferred format.
 - b. Software-generated form with substantially the same content as indicated above.
 - c. Photographs shall be electronic files in JPG format.
 - d. Attachments shall be electronic files in Adobe Acrobat PDF format.
 - 2. Hard-Copy RFIs:
 - a. Permitted under conditions where electronic RFI is not feasible.
 - b. Identify each page of attachments with the RFI number and sequential page number.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond through the Web-based Project Management Software. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs may be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, submit Change Order Request within 10 days of receipt of the RFI response as provided by General Conditions of the Contract.
- E. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
- F. RFI Log: Prepared and maintained by the Construction Manager within the Web-based Project Management Software; Contractor to maintain a separate RFI log with subcontractors.

1.4 SUBCONTRACT LIST

- A. Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Submit electronically in Web-based Project Management Software.

1.5 STAFF NAMES AND ASSIGNMENTS

- A. Submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site, prior to or coinciding with initial Application for Payment.
- B. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers.
- C. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
- D. Post copies of list in Project meeting room, in temporary field office, and by each temporary phone.

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, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format.

4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
 5. 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), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed, unless specifically required by this Project Manual; emailed electronic documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
- D. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Excavations in progress.
 2. Foundations in progress and upon completion.
 3. Structural framing in progress and upon completion.
 4. Enclosure of building, upon completion.
 5. Final completion, minimum of ten (10) photos.
- E. Views:
 1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- F. Digital Photographs: 24 bit color, minimum resolution of 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Web-based Project Management Software.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.
- G. Additional Photographic Requirements: Refer to Section 01 57 21 for photographic documentation requirements for Indoor Air Quality Controls.

3.3 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.

5. LEED submittals and reports.
- B. Package these submittals by specification section, except closeout submittals or Work performed by separate trades, in a single delivery to the Architect; failure of the Contractor to package these submittals in a single delivery may cause the Architect to withhold action on submittal until associated submittals required by the particular specification section are received.
 1. LEED Submittal and LEED Report data required by the Contract Documents and the LEED Certification process to be assembled separately from other submittal types and organized as the first items in any package of submittals; do not rely on the Architect or LEED consultant discovering the required data within product data or any other sort of submittal.
- C. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- D. Product data and shop drawings to be submitted and managed through the Web-based Project Management Software.
- E. Samples will be reviewed only for aesthetic, color, or finish selection.
- F. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - CLOSEOUT SUBMITTALS.

3.4 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Daily construction reports.
 8. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.
- C. Informational submittals to be submitted and managed through the Web-based Project Management Software.

3.5 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Attic Stock/Extra Materials.
 6. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

3.6 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Structural Steel Shop Drawings: Provide two hard copies in addition to electronic submission.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Provide (1) reviewed/approved (with comments) hard copy to be kept on file in the Construction Manager's Field Trailer.
- E. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.7 SUBMITTAL PROCEDURES

- A. Submittals not requested will not be recognized or processed.
- B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough 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 days for initial review of each submittal; duration of time is defined by date received in Architect's office until the day sent from the Architect's office. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal; duration of time is defined by date received in Architect's office until the day sent from the Architect's office.
 - 4. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal; duration of time is defined by date received in consultant's office until the day sent to the Contractor. Submittals required within the following divisions to be sent directly to the Architect's consultants:
 - a. All required submittals indicated in Division 3 section.
 - b. The following required submittals indicated in Division 4:
 - 1) Product data, shop drawings, material certificates, mix designs, and cold-weather procedures.
 - c. All required submittals indicated in the following Division 5 Sections:
 - 1) Structural Steel
 - 2) Steel Joists
 - 3) Steel Decking
 - 4) Cold-Formed Metal Framing

- 5) Metal Stairs
- 6) Railings and Handrails
- 7) Metal Fabrications
- d. All required submittals indicated in the following Division 8 Section:
 - 1) Door Hardware
 - 2) Curtainwall
- e. All required submittals for Food Service Equipment.
- f. All required submittals indicated in Mechanical Divisions 21 through 23 sections.
- g. All required submittals indicated in Division 26 sections.
- h. All required submittals indicated in Divisions 31 through 33 sections.
- 5. Color Selection: Architect will select colors within 60 days (to allow time for presentation to Owner and for Owner comments) after all color samples have been submitted including, but not limited to items listed below. The submittal data shall be complete, including shop drawings, product data, and color samples, and all required submittals and materials shall be in compliance with the specifications and be subsequently approved by the Architect. Color samples shall be actual samples of the material and not photographs. If there is a variation in color, shade, texture, or pattern, submit multiple samples to show full range of variation.
 - a. Interior Items (including but not limited to):
 - 1) Plastic laminate and millwork.
 - 2) Wood door veneer.
 - 3) Ceramic tile.
 - 4) Resilient floor tile.
 - 5) Resilient wall base and accessories.
 - 6) Resinous flooring.
 - 7) Acoustical wall panels.
 - 8) Paint.
 - 9) High-performance coatings.
 - 10) Toilet compartments.
 - 11) Signs and cast letters.
 - 12) Casework veneer.
 - b. Prefinished Exterior Items (including but not limited to):
 - 1) Metal roofing.
 - 2) Copings, perimeter edge systems.
 - 3) Site furnishings and equipment.
- D. Submittal Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.

- h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
 - 2) Number and title of appropriate Specification Section.
 - 3) Drawing number and detail references, as appropriate.
 - 4) Location(s) where product is to be installed, as appropriate.
 - 5) Other necessary identification.
- E. Deviations: Encircle or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Resubmittals:
 - 1. Resubmit submittals until they are marked "No Exception Taken" or "Note Markings".
 - 2. Resubmission of items rejected or marked "Revise and Resubmit" will be reviewed one time by the Architect at no cost to the Contractor. Should the re-submittal be rejected or marked "Revise and Resubmit", the Contractor will reimburse the Owner by credit Change Order for all costs to the Owner for additional time spent by the Architect and the Architect's consultants to review the second (and subsequent) resubmission.
- G. 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.
- H. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" or "Note Markings" taken by Architect.

3.8 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. At Contractor's written request, copies of Architect's CAD Drawing files will be provided to Contractor for Contractor's use in connection with Project; Contractor must sign and return the release form at the end of this Section.
- B. Allow one week for processing, shipping and handling after Architect receives the signed form.
- C. Only the files indicated on Agreement included at the end of this Section shall be made available for use as backgrounds for preparation of shop drawings and coordination drawings. No other CAD Drawing files, for this Project, will be made available.
- D. Request for files other than Architectural must be arranged for with the company responsible for their production.

3.9 DELEGATED DESIGN

- 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 Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, 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.

3.10 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect through the Web-based Project Management Software.
- C. Verify:
 - 1. Field Measurements.
 - 2. Field Construction Criteria.
 - 3. Catalog Numbers and Similar Data.
 - 4. Quantities.
- D. Contractor's responsibility regarding errors and omissions in submittals is not relieved by Architect's review of submittals.
- E. Contractor's responsibility regarding deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations as approved by Owner.
- F. When work is directly related and involves more than one trade, coordinate submittal with other trades and submit under one cover.
- G. After a submittal has been submitted for review, no changes may be made to that Submittal other than changes resulting from review notes made by the Architect unless such changes are clearly identified and circled before being resubmitted. Any failure to comply with this requirement shall nullify and invalidate the Architect's review.
- H. Approval Stamp: Stamp each submittal. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents as indicated below:

THIS IS TO CERTIFY THAT THE SPECIFICATION REQUIREMENTS HAVE BEEN MET AND ALL DIMENSIONS, CONDITIONS, AND QUANTITIES ARE VERIFIED AS SHOWN AND/OR CORRECTED ON THESE DRAWINGS.

SIGNED _____

3.11 ARCHITECT'S/ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it; except where indicated otherwise. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. NO EXCEPTION TAKEN: The Work covered by the submittal is accepted as specified and the Work may proceed provided it complies with requirements of the Contract Documents.

2. NOTE MARKINGS: The Work covered by the submittal is accepted as noted and the Work may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
 3. REVISE AND RESUBMIT: Do not proceed with the Work covered by the submittal. Revise or prepare a new submittal according to the notations and requirements of the Contract Documents, and resubmit without delay. Unmarked items may be fabricated if indicated.
 4. REJECTED: Architect will list reasons for rejection on the submittal or in the transmittal letter accompanying the submittal. Do not proceed with the Work covered by the submittal. Prepare new submittal according to the notations and requirements of the Contract Documents, and resubmit without delay.
 5. ACTION NOT REQUIRED: Either the submittal was not requested or the submittal was for information only or for record purposes.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.12 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site.
1. List of Trade Contractors at the site.
 2. List of major items of equipment on site.
 3. List of construction activities performed (for each trade).
 4. Approximate count of personnel at the site for each trade.
 5. High and low temperatures, general weather conditions.
 6. Accidents and unusual events.
 7. Meetings and significant decisions.
 8. Stoppages, delays, shortages, losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of governing authorities.
 12. Change Orders received, implemented.
 13. Services connected, disconnected.
 14. Equipment or systems tests and start-ups.
 15. Partial Completions, occupancies.
- B. Duplicate copies of the daily construction reports shall accompany the progress report and be turned over to the Architect at the job conference.

END OF SECTION



ELECTRONIC MODEL RELEASE FORM

Architect: Grimm + Parker Architects
11720 Beltsville Drive
Suite 600
Calverton, MD 20705

Contractor/CM: <NAME>
<Address 1>
<Address 2>

Date: <Date>

Project No: G+P No. 21740.00
Project: Urbana Replacement Elementary School for FCPS

Software: Autodesk Revit
Version: 2017

File Name	Date Revised

Contractor/CM shall pay Architect a fee of (\$0)
Terms & Conditions:

1. Architect makes no representation as to the compatibility of the Building Information Model (BIM) with any hardware or software.
2. Since the information set forth in the BIM can be modified unintentionally or otherwise, the Architect reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
3. All information in the BIM is considered instruments of service of the Architect and shall not be used for other projects, for additions to this project, or completion of this project by others. The BIM shall remain the property of the Architect, and in no case shall be transfer of these files be considered a sale.
4. Architect makes no representation regarding the accuracy, completeness, or permanence of the BIM, or for its merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated above may not have been incorporated. In the event of a conflict between the Architect's sealed contract drawings and the BIM files, the sealed contract drawings shall govern. It is the Contractor/CM's responsibility to determine if any conflicts exist. The BIM files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
5. The use of BIM files prepared by the Architect shall not in any way obviate the Contractor/CM's responsibility of the proper checking and coordination of dimensions, details, member sizes and gauge, and quantities of materials as required to facilitate complete and accurate fabrication and erection.

6. The Contractor/CM shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Architect, and its subconsultants from all claims, damages, losses, expenses, penalties, and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the BIM files by the Contractor/CM, or by third party recipients of the BIM files from the Contractor/CM.
7. The Architect believes that no licensing or copyright fees are due to others on account of the transfer of the BIM files, but to the extent any are, the Contractor/CM will pay the appropriate fees and hold the Architect harmless from such claims.
8. Any purchase order number provided by the Contractor/CM is for Contractor/CM's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
9. Payment of the service fee is due upon receipt of the BIM files.
10. This agreement shall be governed by the laws of the principal place of business of the Architect.

AUTHORIZED ACCEPTANCE

By Architect

Signature

Print Name and Title

Date

By Contractor/CM

Signature

Print Name and Title

Date



**An Agreement between Architect and Contractor
for Transfer of Computer Aided Drafting (CAD) Drawing Files on Electronic Media**

Architect	Grimm + Parker Architects 11720 Beltsville Drive, Suite 600 Calverton, MD 20705	Contractor	<hr/> <hr/> <hr/>
Project No.	21740.00	Date	<hr/>
Project Name:	Urbana Replacement Elementary School for FCPS		
Location:	Urbana, MD		

The Architect will provide the following CAD Drawings files, dated _____, for the convenience of the Contractor in preparing shop fabrication drawings:

TERMS AND CONDITIONS:

1. Architect makes no representation as to the compatibility of the CAD Drawing files with any hardware or software.
2. Since the information set forth on the CAD Drawing files can be modified unintentionally or otherwise, the Architect reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
3. All information on the CAD Drawing files is considered instruments of service of the Architect and shall not be used for other projects, for additions to this project, or completion of this project by others. CAD Drawing files shall remain the property of the Architect, and in no case shall the transfer of these files be considered a sale.
4. Architect makes no representation regarding the accuracy, completeness, or permanence of CAD Drawing files; nor for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD Drawing files may not have been incorporated. In the event of a conflict between the Architect's sealed contract drawings and CAD Drawing files, the sealed contract drawings shall govern. It is the Contractor's responsibility to determine if any conflicts exist. The CAD Drawing files shall not be considered to be Contract Documents as defined by the General Conditions of Contract.
5. The use of CAD Drawing files prepared by the Architect shall not in any way obviate the Contractor's responsibility of the proper checking and coordination of dimensions, details, member sizes and gage, and quantities of materials as required to facilitate complete and accurate fabrication and erection.



6. The Contractor shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Architect, and its Consultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of the CAD Drawing files by the Contractor, or by third party recipients of the CAD Drawing files from the Contractor.
7. The Architect believes that no licensing or copyright fees are due to others on account of the transfer of the CAD Drawing files, but to the extent any are, the Contractor will pay the appropriate fees and hold the Architect harmless from such claims.
8. Any purchase order number provided by the Contractor is for Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
9. This agreement shall be governed by the laws of the principal place of business of the Architect.

AUTHORIZED ACCEPTANCE

by Architect

by Contractor

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date



SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project: _____

From (Contractor): _____

Date: _____

To (A/E): _____

A/E Project Number: _____

Contract For: _____

List Subcontractors and Major Material Suppliers proposed for use on this Project as required by the Construction Documents. Attach supplemental sheets if necessary.

Section Number	Section Title	Firm	Address	Phone Number (Fax Number)	Contact
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☐ Attachments

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

SECTION 01 31 14 - FACILITY SERVICES COORDINATION**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Coordination documents.

1.2 SUBMITTALS

- A. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.
- B. Submit electronically.
- C. Areas of Work requiring Coordination Drawings include (but not limited to) mechanical rooms, electrical rooms, equipment rooms, corridors, horizontal exits from duct shafts, cross-overs and any other areas where congestion of Work occurs. Complete the requirements for Coordination Drawings within 75 days of starting construction operations. Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale.
 2. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. The Construction Documents in their original, copies or electronic file form are the Architect's instrument of service and are protected under copyright laws.
 3. Include the following information, as applicable:
 - a. Follow routing shown on Contract Drawings 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.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate required installation sequences.
 - d. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
 5. Each trade shall sign and date the Coordination Drawings after the addition of their information.
 6. Do not begin fabrication until receipt of completed Coordination Drawings are acknowledged by the each contractor in writing to the Architect.
 7. No progress payments will be made for any work affected by coordination drawings until coordination drawings governing that work have been accepted.
 8. Any work installed prior to approval of coordination drawings shall be modified or replaced, as necessary, to conform to subsequently-approved construction drawings, at no additional cost to Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 COORDINATION REQUIRED

- A. Coordinate the work listed below:
 - 1. Fire Suppression: Division 21.
 - 2. Plumbing: Division 22.
 - 3. Heating, Ventilating, and Air Conditioning: Division 23.
 - 4. Integrated Automation: Division 25.
 - 5. Electrical: Division 26.
 - 6. Communications: Division 27.
 - 7. Electronic Safety and Security: Division 28.
 - 8. Site Utilities: Division 33.
 - 9. Commissioning requirements throughout the Project Manual.
- B. Coordinate progress schedules, including dates for submittals and for delivery of products.
- C. Conduct meetings among Subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- E. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- F. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- G. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
- H. Make adequate provisions to accommodate items scheduled for later installation.

3.2 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
 - 1. Priority of Construction Space:
 - a. Coordinate installation of different components to ensure performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
 - b. Following is the Order of Priority of construction space:
 - 1) First: Ductwork.
 - 2) Second: Fire protection piping.
 - 3) Third: Other piping.
 - 4) Fourth: Conduit.
- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.

- C. Identify electrical power characteristics and control wiring required for each item of equipment.
- D. Maintain maximum headroom at all locations without finished ceilings.
- E. Maintain finished ceiling heights as indicated.
- F. Coordinate installations with other trades to prevent conflict with Work of other trades and cooperate in making reasonable modifications in layout as needed.
- G. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Architect shall be consulted for assistance in coordination of the available space to accommodate all trades.
- H. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- I. Any construction delays required to accomplish coordination, approval of submittals or re-submittals, or consequent to coordination work, shall be incurred at no additional cost to Owner; such delays may include, but not be limited to , the following:
 - 1. Time taken for preparation and submission of acceptable coordination drawings, including a reasonable period for Architect's review and approval.
 - 2. Time taken for preparation and approval of acceptable mock-ups.
 - 3. Time taken for modifications and replacements of non-conforming work.

3.3 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.
- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.

3.4 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.

3.5 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.6 EQUIPMENT START-UP

- A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.
- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.

- C. Observe equipment demonstrations made to Owner; record times and additional information required for operation and maintenance manuals.

3.7 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
- B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.
- C. Responsibility for completion of Work per schedule and preparation of recovery schedules.

1.2 REFERENCES**1.3 SUBMITTALS**

- A. Within 15 days after date of 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.
- F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- G. Submit under transmittal letter form specified in Section 01 30 00.

1.4 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION****3.1 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.2 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- C. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed

submittals will be required from Architect, within the Web-based Project Management Software. Indicate decision dates for selection of finishes.

1. The Architect shall maintain the submittal log between the Architect and Contractor through Web-based Project Management Software.
 2. Contractor to maintain a submittal log with subcontractors.
- E. Coordinate content with schedule of values specified in Section 01 20 00.
- F. Provide legend for symbols and abbreviations used.

3.3 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers.
 2. Activity description.
 3. Estimated duration of activity, in maximum 15 day intervals.
 4. Earliest start date.
 5. Earliest finish date.
 6. Actual start date.
 7. Actual finish date.
 8. Latest start date.
 9. Latest finish date.
 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
 11. Monetary value of activity, keyed to Schedule of Values.
 12. Percentage of activity completed.
 13. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
 2. By amount of float, then in order of early start.

3.4 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 FLOAT TIME

- A. Float is not for the exclusive benefit of either Contractor or Owner.
- B. Manage work according to early start dates, by commencing activities on the early start date (calculated by the latest approved Contract Schedule) or earlier if possible, unless constrained by a bona fide resource limitation.
- C. Owner may reserve and apportion float time according to the needs of the Project.

- D. Actual or projected Owner-caused delays that do not exceed available float time shall not have any effect upon Contractor's adherence to specified time constraints and shall not be a basis for any time extension.
- E. Contractor acknowledges the following:
 - 1. Activity delays shall not automatically result in adjustment of specified time constraints.
 - 2. A Change Order or other Owner action or inaction may not affect existing critical activities or cause non-critical activities to become critical.
 - 3. A Change Order or delay may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on specified time constraints.
- F. Pursuant to the above float sharing requirements, use of float released by elimination of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, unreasonably extended activity durations, or imposed dates shall be distributed by Owner to the benefit of Owner and Contractor.
- G. In the event of the Contractor wishes to complete the Work earlier than the time specified therefore:
 - 1. Continue to calculate float based on the Work completion date specified as of Contract execution, by maintaining the specified Work completion date as a "finish-no-later-than" constraint.
 - 2. The completion time for the Work shall be amended by Owner's acceptance of or acquiescence to Contractor's proposed earlier completion date.
 - 3. Contractor shall not, under any circumstances, receive additional compensation for indirect, general, administrative or other forms of overhead costs, for the period between the time of earlier completion proposed by Contractor and the completion time for the Work specified as of NTP.

3.6 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.7 RESPONSIBILITY FOR COMPLETION

- A. Take a combination of the following actions, at no additional cost to the Owner, when the progress schedule illustrates that the Contract Substantial Completion date can not be met:
 - 1. Increase construction manpower in such quantities and trades to substantially eliminate the backlog of Work.

2. Increase the number of work hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination to substantially eliminate the backlog of Work.
 3. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities.
- B. Recovery Schedule: Prepare a recovery schedule from all trades to accelerate progress, if a milestone is missed, a single duration work activity is incomplete for ten work days, or overall work progress is deemed insufficient by the Owner/Architect.
1. A recovery schedule must be initiated by the Contractor, reviewed by effected trade contractors and submitted ten working days after one of the above conditions occurs.
 2. Submit recovery schedule in same number of copies as original.
 3. Trades must execute means necessary to bring the Project back on schedule using the recovery schedule; accelerated Work and additional overhead necessary to keep the Project on schedule is included in the Contract.
 4. Recovery schedule to be double the size of the original diagram, as a minimum, illustrating existing and revised activities alongside original data; revised activities must be easily differentiated from original schedule.
- C. Failure of the Contractor to comply with requirements of this subsection may be a basis for determination that the Contractor is not prosecuting the Work with such diligence as will ensure completion within the time stipulated; upon such determination, the Owner may take such action deemed appropriate.

3.8 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 35 53 - SECURITY PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.2 SECURITY PROGRAM

- A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program at project mobilization.
- C. Maintain program throughout construction period until Owner occupancy.

1.3 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Owner on request.

1.4 PERSONNEL IDENTIFICATION

- A. Provide identification badge to each person authorized to enter premises.
- B. Badge To Include: Personal photograph, name and employer.
- C. Require return of badges at expiration of their employment on the Work.

1.5 RESTRICTIONS

- A. Do not allow cameras on site or photographs taken except by written approval of Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. References and standards.
- B. Quality assurance submittals.
- C. Mock-ups.
- D. Control of installation.
- E. Tolerances.
- F. Testing and inspection services.
- G. Manufacturers' field services.

1.2 REFERENCE STANDARDS

- A. 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; 2012a.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- C. Schedule of Tests and Inspections: Prepare in tabular form, within 30 days following mobilization, and include the following:
 - 1. Specification section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- D. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- E. 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. Conformance 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 conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- F. 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 conforms to 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.
- G. 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.
- H. 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 conformance with information given and the design concept expressed in the contract documents.

1.4 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 TESTING AND INSPECTION AGENCIES

- A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
 - 1. The individual specification section must clearly state that testing is the Owner's responsibility, otherwise the testing to be executed by Contractor.
- 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 ASTM E 329.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory: Authorized to operate in the State of Maryland.

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.
- H. Contractor must develop a plan to monitor and control installation and protection of Work to ensure compliance with LEED requirements specified elsewhere and acoustical integrity, including but not limited to the following:
 - 1. Clear airspace with no bridging elements at structural isolation joints.
 - 2. Independence of steel stud framing and/or masonry at double/triple wall construction.
 - 3. Mass and airtightness of gypsum board assemblies.
 - 4. Solidity, mass, and airtightness of concrete and masonry construction.
 - 5. Grout fill at sound-rated/sound-control door and window frames.
 - 6. Mass of sound-control door leaves.
 - 7. Tolerances between sound-rated/sound-control doors, frames, thresholds, and perimeter seals.
 - 8. Proper compression and adjustment of perimeter seals at sound-rated/sound-control doors.
 - 9. Locations and quiet operation of door latching and closer hardware.
 - 10. Tolerances between window sashes, frames, and perimeter seals.
 - 11. Thicknesses of laminated glazing and airtightness of perimeter seals at sound-control windows

12. Extent and coverage of sound-attenuation blankets above ceilings and in partitions.
13. Shaping of wall and ceiling finishes.
14. Extent, location, and thickness of sound-absorbing finishes.
15. Extent, location, operation, and storage of adjustable sound-absorbing drapery.
16. Extent and shaping of ceiling reflectors.
17. Acoustical transparency of scrim materials.
18. Rigid attachment of finish materials to substrates.
19. Restrictions on routing of ductwork, piping, conduit, wiring, cable and sleeves.
20. Resilient sealing of penetrations.
21. Sheet caulking at electrical boxes within gypsum board assemblies.
22. Flexible connections of plumbing, mechanical, electrical, and communications systems at equipment and structural isolation joints.
23. Sound power/pressure level limits of mechanical equipment and air devices.
24. Vibration isolation of conveying, plumbing, mechanical, electrical, and communications systems.
25. Location and performance of duct sound attenuators.
26. Internal duct lining in ductwork, plenums, and shafts.
27. External lagging of ductwork and piping.
28. Locations of volume control dampers.
29. Location and orientation of transfer ducts.
30. Reports for testing, adjusting, and balancing of HVAC systems.
31. Silent operation of theatrical and architectural lighting.
32. Silent operation of fluorescent ballasts.
33. Silent operation of fire alarm system in standby mode.
34. Remote location of transformers and power supplies.

3.2 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

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. 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-conformance of Work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify 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.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-conformance to 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 of 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 conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Temporary telecommunications services.
- B. Temporary telephone service.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.

1.2 RELATED REQUIREMENTS

- A. Section 01 51 00 - Temporary Utilities.
- B. Section 01 52 13 - Field Offices and Sheds.
- C. Section 01 55 00 - Vehicular Access and Parking.
- D. Section 46 - Security Procedures.
- E. Section 01 58 13 - Temporary Project Signage.
- F. Section 01 81 13 - Sustainable Design Requirements - LEED.

1.3 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; 3G WiFi access equipment or faster.
 - 4. Email: Account/address reserved for project use.

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities located at the existing building is not permitted.
- C. Maintain daily in clean and sanitary condition.

1.5 BARRIERS

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

1.6 FENCING

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

1.7 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00 - TEMPORARY UTILITIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.2 RELATED REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.3 TEMPORARY ELECTRICITY

- A. Cost: The cost of providing and maintaining temporary electricity shall be the responsibility of the assigned Contractor. The cost of the public utility is the responsibility of the Owner.
- B. Provide power service required from utility source.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- D. Provide main service disconnect and over-current protection at convenient location and meter.
- E. Permanent convenience receptacles may be utilized during construction.
- F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.

1.5 TEMPORARY HEATING

- A. Cost of Energy: By assigned Contractor.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.6 TEMPORARY COOLING

- A. Cost of Energy: By assigned Contractor.
- B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

- D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.7 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Owner.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 52 13 - FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary field offices for use of Contractor.
- B. Maintenance and removal.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.
- C. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

2.3 ENVIRONMENTAL CONTROL

- A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.4 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- C. Other Furnishings: Contractor's option.
- D. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer .

PART 3 EXECUTION

3.1 PREPARATION

- A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- B. Parking: Two hard surfaced parking spaces for use by Owner and Architect, connected to office by hard surfaced walk.

3.3 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

3.4 REMOVAL

- A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 55 00 - VEHICULAR ACCESS AND PARKING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Access roads.
- B. Driveways, entrance and traffic routes.
- C. Parking.
- D. Existing pavements and parking areas.
- E. Permanent pavements and parking facilities.
- F. Construction parking controls.
- G. Flag persons.
- H. Haul routes.
- I. Traffic signs and signals.
- J. Maintenance.
- K. Removal, repair.
- L. Mud from site vehicles.

PART 3 EXECUTION**2.1 ACCESS ROADS**

- A. Tracked vehicles not allowed on paved areas.
- B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.
- C. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
- D. Extend and relocate as Work progress requires, provide detours as necessary for unimpeded traffic flow.
- E. Location as approved by Architect.
- F. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- G. Provide and maintain access to fire hydrants free of obstructions.

2.2 DRIVEWAYS, ENTRANCE AND TRAFFIC ROUTES

- A. Keep driveways and entrances serving premises and site surrounding Project clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Provide continuous monitoring of site.
 - 1. Schedule deliveries to minimize use of driveways and entrances.
 - 2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Truck deliveries shall be scheduled so that the streets adjacent to the site do not back up with delivery trucks waiting to deliver materials. Trucks must be scheduled accordingly, or wait to unload inside the fence in the project site or off the Owner's property.

2.3 PARKING

- A. Use of existing parking facilities by construction personnel is not permitted.
- B. Use of new parking facilities by construction personnel is not permitted.
- C. Do not allow heavy vehicles or construction equipment in parking areas.
- D. Arrange for temporary parking areas to accommodate use of construction personnel.
- E. When site space is not adequate, provide additional off-site parking.
- F. Locate as approved by Architect.

2.4 NEW PERMANENT PAVEMENTS

- A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
- B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

2.5 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles . Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

2.6 FLAG PERSONS

- A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

2.7 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

2.8 TRAFFIC SIGNS AND SIGNALS

- A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.
- C. Relocate as Work progresses, to maintain effective traffic control.

2.9 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, Products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

2.10 REMOVAL, REPAIR

- A. Repair existing and new permanent facilities damaged by use, to original condition.
- B. Remove equipment and devices when no longer required.
- C. Repair damage caused by installation.

2.11 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 58 13 - TEMPORARY PROJECT SIGNAGE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Project identification sign.
- B. Project informational signs.

1.2 QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr wind velocity.
- B. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

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.
- D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
- E. Lettering: Exterior quality paint, colors as selected.

2.2 PROJECT IDENTIFICATION SIGN

- A. One painted sign, 48 sq ft area, bottom 6 feet above ground.
- B. Design, Colors and Content: Refer to attached Appendix E, Construction Sign for State Funded School Construction Projects.

2.3 PROJECT INFORMATIONAL SIGNS

- A. Provide signs designation construction access at entrances designated for construction access.
- B. Provide no trespassing and hard hat area signs.

PART 3 EXECUTION**3.1 INSTALLATION**

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at designated location.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. 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



(Enter Jurisdiction)

the

(Select From Page E-1A)

(Enter School Name)

SCHOOL

Public School Construction Program

Architect:

(Name of Firm)

Contractor:

(Name of Company)

The Maryland General Assembly

Michael E. Busch, Speaker of the House

Thomas V. Mike Miller, Jr., President of the Senate

Board of Public Works

Larry Hogan, Governor

Peter Franchot, Comptroller

Nancy K. Kopp, Treasurer

72"

96"

APPENDIX E FOR SCHOOL CONSTRUCTION SIGN

The following appropriate language should be entered on the construction sign to describe the work for the specific project (or modified as required):

- Renovating
- Constructing an Addition and Renovating
- Constructing an Addition to
- Constructing a Replacement School for
- Constructing the New
- Constructing a Prekindergarten Addition at
- Renovating the Science Laboratories at
- Replacing the Roof at
- Replacing the Boilers at
- Replacing the Windows at
- Replacing the (other systemic) at

SECTION 01 60 00 - PRODUCT REQUIREMENTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

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

1.2 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 45 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Comparable Product Request Submittal: Submit request for consideration of each comparable product or system for evaluation by Architect in accordance with submittal procedures specified in this Section for Substitution Requests.
 - 1. Submit Comparable Product requests prior to or with second full-month Application for Payment.
- C. 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.
- D. 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.
- E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS**2.1 EXISTING PRODUCTS**

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by 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.
- D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.2 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 2. Have longer documented life span under normal use.
 - 3. Result in less construction waste.
 - 4. Are made of vegetable materials that are rapidly renewable.
- C. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- D. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

2.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products of Named Manufacturers: Contractor to provide products from named manufacturers; refer to other provisions regarding substitutions.
- C. Named Products: Products identified by manufacturer, make or model number or other designation shown or listed in manufacturer's published product literature.
- D. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating Comparable Product of other named manufacturers.
- E. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product. Comparable Products include:
 - 1. Product of manufacturer listed without identified product; either with or without Basis-of-Design product identified in the Section.
 - 2. Product of manufacturer other than manufacturer/product listed and followed with "or equal," "or approved equal," or similar phrase.
- F. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles. Architect will consider requests for substitutions only only if received 14 days prior to Bid Date. Requests received after that time may be considered or rejected at discretion of Architect. Substitution requests after bids are received will be considered only for reasons given below.
 - 1. Manufacturer or product specified is no longer available.
 - 2. Product specified will not receive necessary approval of authorities having jurisdiction.
 - 3. Product specified will not produce indicated results.
 - 4. Product specified is not compatible with other portions of the Work.
 - 5. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
 - 6. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents, as attachments to the Substitution Request Form.
 - 1. Statement indicating why specified material or product cannot be provided.
 - 2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - 3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - 5. Samples, where applicable or requested.
 - 6. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - 7. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - 8. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - 9. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time,

- include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
10. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 11. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 12. After Bidding:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Cost savings offered to the Owner; proposed substitutions without a cost benefit to the Owner will not be considered.
- C. A request for substitution 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, including sustainability attributes required by LEED.
 2. Will provide the same warranty for the substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
 6. Where a proposed substitution involves more than one Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Substitution Submittal Procedure:
1. Substitution Request Form: Use Grimm and Parker Form attached to this Section.
 2. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 4. Architect will consider Contractor's request for substitution when the following conditions are met. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Substitution requested must meet or exceed specified material, product or equipment items appearance, function and quality level as determined by the Architect and Owner.
 - b. Requests for substitution must include clear identification of the material, product or equipment item and complete description including drawings, cuts, performance and test data, along with any other information necessary for a complete evaluation.
 - c. Requested substitution shall not require extensive revisions to the Contract Documents or changes to any other materials, products or equipment items.
 - d. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's Construction Schedule.

- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - h. Requested substitution is compatible with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. Requested substitution will not delay the Work.
 - k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - l. The Architect's/Owner's decision to accept or reject the proposed substitution shall be final and will be set forth in writing.
- F. Architect's Action: Architect's notification of acceptance will be in the following forms:
 - 1. During Bidding: Indicated within an Addendum.
 - 2. After Contract signing: Change Order.
 - 3. Use product specified if Architect cannot make a decision on use of a proposed substitution due to incomplete documentation.
 - 4. Absence of request for additional information or mention within Addenda it to be interpreted as rejection of proposed substitution.

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.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

- A. 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- J. Prevent contact with material that may cause corrosion, discoloration, or staining.
- K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- L. 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

Substitution Request Form

IDENTIFICATION:

Contractor/CM: _____

Project Name: _____

Date: _____

REFERENCE:

Specification Title: _____

Specification No.: _____ Page: _____ Article/ Paragraph: _____

DESCRIPTION:

Proposed Substitution: _____

Manufacturer: _____

History: ☐ New Product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Reason for requesting substitution: ☐ Cause ☐ Convenience

Explain: _____

Differences between proposed substitution and specified item: _____

(Use attachment for additional space, if required.)

Proposed substitution affects other parts of Work or applicable Code requirements as follows: _____

(Use attachment for additional space, if required.)

Post-Bid Savings to Owner for accepting substitution: (N/A Pre-Bid) _____

Change to Contract Time due to accepting substitution: _____

LEED Contribution (if applicable to Project) - Explain effects to LEED Action Plan: _____

(Use attachment for additional space, if required.)

Will undersigned pay any costs caused by the substitution necessitating changes to the building design, construction, engineering and detailing, including additional Architect, inspection and testing fees? ☐ Yes ☐ No

Does the undersigned waive rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results? ☐ Yes ☐ No

Submitted by: _____
(Contractor or CM Only)

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

SUPPORTING DATA ATTACHED:

☐ Point-by-Point Comparative Data Attached (Required)

☐ Completed Section 01 61 16.01, Accessory Material VOC Content Certification Form Attached (Required)

☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

CERTIFICATION:

The Undersigned certifies:

- Proposed substitution has been investigated and determined that it meets or exceeds the quality level of the specified product.
- Same warranty will be furnished for proposed substitution as for specified product; **provide attachment if different.**
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances; **provide attachment if otherwise.**
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- Neither the Owner and Architect will be liable for license fees or royalties.

A/E's REVIEW AND ACTION:

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 60 00.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 60 00.
- ☐ Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Signed by: _____

Date: _____

ADDITIONAL COMMENTS:

Contractor:

Architect:

Approvals are based upon the opinion, knowledge, information, and belief of Architect at time of decision and reliance upon data submitted. Approvals are therefore interim and subject to reconsideration as additional data, materials, workmanship and coordination with other Work are observed and reviewed. In proposing items, Contractor assumes risks, costs and responsibilities for items integration into Work and performance.

END OF FORM

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SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- 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. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.
 - h. Date and time work will be executed.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.4 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in the State of Maryland and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.5 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. 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.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations. Trade Contractors must abide by the local noise ordinance requirements.
- E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- 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.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

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.
 - 3. Review conflicts and compatibility issues.
 - 4. Review environmental limitations and protection.
 - 5. Examine substrates.
 - 6. Review requirements of the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Submittals.
 - e. Mockups.
 - f. Testing and inspection.
- 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 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- H. Periodically verify layouts by same means.

- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5 GENERAL INSTALLATION REQUIREMENTS

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

3.6 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-conforming work.
- C. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.

- 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.7 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.

3.8 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 plastic coverings if possible.

3.9 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. 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.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 ADJUSTING

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

3.11 FINAL CLEANING

- A. Employ experienced workers or professional cleaners for final cleaning; clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.
- B. Use cleaning materials that are nonhazardous.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean debris from roofs, gutters, downspouts, and drainage systems.
- E. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- F. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- G. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- H. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- I. Remove tools, construction equipment, machinery, and surplus material from Project site.
- J. Remove snow and ice to provide safe access to building.
- K. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- L. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- M. Sweep concrete floors broom clean in unoccupied spaces.
- N. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- O. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- P. Remove labels that are not permanent.
- Q. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - 2. Revise seven subparagraphs below to suit Project. Check for conflict or duplication with provisions in other Sections, particularly Divisions 20 through 29.
- R. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- S. Replace parts subject to unusual operating conditions.
- T. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- U. Clean exposed surfaces of diffusers, registers, and grills.
- V. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- W. Leave Project clean and ready for occupancy.

END OF SECTION

SECTION 01 74 19**CONSTRUCTION AND DEMOLITION 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: Schools) Rating System and as outlined within this section. Throughout this section, the term LEED is used in place of LEED BD+C: Schools.
- B. Related sections: The following sections contain requirements that relate to this section:
 - 1. Division 01 Section "Sustainable Design Requirements-LEED" for definitions and reference standards relating to waste management, referenced herein.
 - 2. Division 02 Sections referring to demolition.

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.
 - 3. Describe means and methods to achieve required goal.
 - a. MR Prerequisite 2 and Credit 5 Option 1:
 - 1) Indicate whether materials will be separated on site or comingled.
 - 2) Identify recycling contractors and haulers proposed for the project and locations accepting waste materials or entities providing related services.
 - 3) Describe how the recycling facility will process the material.

- 4) 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, GENERAL

- 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. Comingled 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.
1. For renovation projects: Re-sale of existing furniture is acceptable means for diversion.

- 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 77 00 - CLOSEOUT PROCEDURES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.

1.2 RELATED REQUIREMENTS

- A. Section 01 20 00 - Price and Payment Procedures.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

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

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION



PUNCH LIST

Project: _____

From (A/E): _____

Site Visit Date: _____

To (Contractor): _____

A/E Project Number: _____

Contract For: _____

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check
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☐ Attachments

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

SECTION 01 78 00 - 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 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 018113 - Sustainable Design Requirements - LEED: Submittals required for LEED-Online documentation and closeout requirements for LEED compliance.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

- A. Project Record Documents: The following items must be submitted and accepted prior to claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Contractor submits PDF via web-based project management software near but prior to Substantial Completion (Contractors who complete their work significantly prior to Substantial Completion will submit their O&M's early at the time of their completion). Design Team reviews PDF and returns comments only. If NM or NET, Contractor then incorporates comments, creates new PDF, and prints 2 sets. Construction Manager gives FCPS 2 hard sets and an electronic set.
- 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.
 - 5. Reviewed shop drawings, product data, and samples.

- 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. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

- A. 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. 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.

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. 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.
- C. 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.

- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Provide control diagrams by controls manufacturer as installed.
- I. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- J. Lamp Submittal: Include data on all lamps labeled according to fixture type; this data shall include:
 - 1. Manufacturer.
 - 2. Lamp designation (ex. PAR38, M16, T5HO).
 - 3. Manufacturer's catalog number.
 - 4. Wattage.
 - 5. Color temperature.
 - 6. CRI.
 - 7. Beam spread.
 - 8. Initial lumens.
 - 9. Catalog spec sheet for each fixture type.
- K. Additional Requirements: As specified in individual product specification sections.

3.5 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual; electronic and two print sets.
- 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. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.

- b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
- J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

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 the 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.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 79 00 - 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; comply with pertinent LEED requirements.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Security and audio visual systems.
 - 6. Conveying systems.
 - 7. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.2 SUBMITTALS

- A. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.3 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.
- F. Coordinate demonstration and training requirements with commissioning requirements.

END OF SECTION

SECTION 01 81 13**SUSTAINABLE DESIGN REQUIREMENTS - LEED****PART 1 - GENERAL****1.1 SUMMARY**

- A. This project is designed to achieve all Prerequisites and no less than 50 points under the US Green Building Council's LEED® v4 for Building Design and Construction (LEED BD+C: Schools) Rating System for at least a LEED Silver-level rating. Throughout this section, the term LEED is used in place of LEED BD+C: Schools.
 - 1. Certain LEED prerequisites and credits needed to obtain LEED certification are dependent on material selections. Compliance with LEED prerequisites and credits is a basis for evaluation of substitution requests.
 - 2. Additional LEED prerequisites and credits needed to obtain indicated LEED certification are dependent on Architect's design and other aspects of the Project that are not part of the Work of Contract.
- B. Refer to LEED Scorecard accompanying this Section for LEED Prerequisites and Credits pursued for this project.
- C. LEED has no published numbering system. This project manual imposes a numbering system based on that created by LEEDUser®. This numbering system is indicated on the LEED Scorecard and utilized throughout these specifications.
- D. Contractor is responsible for all requirements of LEED Prerequisites and Credits that are contained throughout these specifications.
- E. Contractor is not responsible for the application for LEED certification.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 01 Section "Construction and Demolition Waste Management and Disposal" for detailed LEED requirements to be incorporated into construction process.
- B. Division 01 Section "General Commissioning Requirements" for detailed commissioning requirements.

1.3 REFERENCES

- A. Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 885–2008
- B. American National Standards Institute (ANSI) Standard S12.60-2010, Part 1, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools
- C. American National Standards Institute / Business and Institutional Furniture Association (ANSI/BIFMA) Standard Method M7.1–2011 Standard Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating and ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2

- D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 2011 HVAC Applications Handbook, Chapter 48, Noise and Vibration Control
- E. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 52.2-2007: Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size
- F. ASHRAE 62.1-2010, Sections 4–7, Ventilation for Acceptable Indoor Air Quality
- G. ASHRAE/IESNA 90.1-2010 Final Qualitative Determination
- H. American Society for Testing and Materials (ASTM) E1527-05, Phase I Environmental Site Assessment
- I. ASTM E1903-11, Phase II Environmental Site Assessment
- J. American Society for Testing and Materials ASTM Test Method D6866-12: Standard Test Methods for Determining the Bio-based Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis
- K. Association for Contract Textiles (ACT) Facts Certification Program (NSF /ANSI 336-2011: Sustainability Assessment for Commercial Furnishings Fabrics Standard)
- L. ASTM D2369-10: Standard Test Method for Volatile Content of Coatings
- M. California Department of Health Services (CDPH) Standard Method (SM) for Testing and Evaluation from Indoor Sources Using Environmental Chambers V1.1–2010, Section 8 (guidelines for first-party and third-party claims for low-emitting materials). Standards and certification methods that may comply with CDPH include, but are not limited to the following.
 - 1. ANSI / BIFMA e3 Furniture Sustainability Standard
 - 2. Carpet and Rug Institute’s (CRI) Green Label Plus (GLP)
 - 3. Collaborative for High Performance Schools (CHPS) High Performance Product Database
 - 4. GREENGUARD Gold Certification
 - 5. National Sanitation Foundation (NSF) International Sustainability Standard 332
 - 6. Resilient Floor Covering Institute’s (RFCI) FloorScore Program
 - 7. Scientific Certification Systems, Inc. (SCS), also known as SCS Global Services, Indoor Advantage and Indoor Advantage Gold
- N. California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings
- O. CARB, Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, Phase II, ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins
- P. Cradle to Cradle (C2C) Material Health Certificate
- Q. Declare Product Database (International Living Future Institute)

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- R. Federal Trade Commission (FTC), Guidelines for the Use of Environmental Marketing Claims – 16 CFR 260.7 (e)
 - S. Forest Stewardship Council (FSC) Guidelines
 - T. International Organization for Standardization (ISO) Standard 11890-1:2007: Paints and varnishes – Determination of volatile organic compound (VOC) content – Part 1: Difference method
 - U. ISO Standard 11890-2:2013: Paints and varnishes – Determination of volatile organic compound (VOC) content – Part 2: Gas-chromatographic method
 - V. ISO Standard 14021-1999 – Environmental Labels and Declarations – Self-Declared Environmental Claims (Type II Environmental Labeling)
 - W. ISO Standard 14025-2006, Environmental Labels and Declarations – Type III Environmental Declarations – Principles and Procedures
 - X. ISO Standard 14040-2006, Environmental Management, Lifecycle Assessment Principles and Framework
 - Y. ISO Standard 14044-2006, Environmental Management Lifecycle Assessment Requirements and Guidelines
 - Z. ISO Standard 21930-2007, Sustainability in Building Construction – Environmental Declaration of Building Products
 - AA. ISO Standard Guide 65 (for organizations certifying CDPH claims)
 - BB. ISO Standard / IEC 17025 (for laboratory accreditation for CDPH testing methods)
 - CC. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2nd Edition, 2007, ANSI-SMACNA 008-2008, Chapter 3
 - DD. South Coast Air Quality Management District (SCAQMD) Rule #1113: “Architectural Coatings” effective June 3, 2011
 - EE. South Coast Air Quality Management District (SCAQMD) Rule #1168: “Adhesive and Sealant Applications” effective July 1, 2005
 - FF. Sustainable Agriculture Network's (SAN) Sustainable Agriculture Standard
 - GG. Underwriter's Laboratories (UL) Product Lens Certification
 - HH. United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS)
 - II. US Environmental Protection Agency (EPA) TO-11 and EPA Compendium Method IP-6 for Formaldehyde

- JJ. US EPA Compendium Method IP-1 for Total Volatile Organic Compounds, IP-3 for Carbon Monoxide, IP-10 for Particulates
- KK. US EPA TO-1, TO-17 for Total volatile organic compounds and for Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde
- LL. US EPA Construction General Permit (CGP) 2012
- MM. US EPA WaterSense Label and WaterSense Water Budget Tool
- NN. US EPA ENERGY STAR Program
- OO. United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System:
 - 1. LEED version 4 (LEED v4) for Building Design and Construction (BD+C), with all current addenda

1.4 DEFINITIONS

- A. **BIO-BASED PRODUCTS:** Products demonstrating Sustainable Agriculture Network's (SAN) Sustainable Agriculture Standard, tested in accordance with ASTM Test Method D6866, legally harvested as defined by the exporting and receiving country. Hide products such as leather and other animal skin material are excluded.
- B. **BROWNFIELD:** Expansion, redevelopment, or reuse of real property, complicated by the presence or potential presence of a hazardous substance, pollutant or contaminant (Public Law 107-118, H.R. 2869, Small Business Liability Relief and Brownfield Revitalization Act).
- C. **BUILDING WATERPROOFING MEMBRANE:** Includes materials which make up the complete waterproofing system for the building exterior.
- D. **BUILDING INTERIOR:** Includes materials and products installed within the building waterproofing membrane, but excluding the waterproofing membrane itself.
- E. **BUILDING EXTERIOR:** Includes materials and products installed outside and inclusive of the primary and secondary waterproofing system, including air-resistive and water-resistive barrier materials.
- F. **CERTIFIED WOOD:** Wood grown in sustainably managed forest(s) certified by a Forest Stewardship Council (FSC) accredited certification agency. FSC-Certified wood products must have Chain-of-Custody (CoC) from forest to manufacturer.
- G. **CHAIN-OF-CUSTODY (CoC):** Tracking procedure used to verify compliance with Forest Stewardship Council (FSC) guidelines for documenting the status of wood products from the forest to the ultimate consumer.
- H. **COMMINGLED WASTE:** Construction and demolition waste streams combined on-site and sorted off-site into recyclable streams. Also known as single-stream recycling.
- I. **COMPOSITE WOOD:** Products such as particleboard, medium density fiberboard (MDF), hardwood plywood, and door cores that are a composite of wood pressed and adhered together

by synthetic resin or binder; as defined by the California Air Resources Board (CARB), Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, Phase II. Composite wood does not include hardboard, structural plywood, structural panels, structural composite lumber, oriented strand board (OSB), glue laminated lumber, prefabricated joists, or finger-jointed lumber.

- J. **COMPOSITE WOOD EVALUATION:** Certification for testing composite wood for low formaldehyde emissions compliance in accordance with CARB ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins (NAF).
- K. **CONSTRUCTION WASTE:** Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition.
- L. **ENVIRONMENTAL PRODUCT DECLARATION (EPD):** Product disclosure conforming to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 with at least cradle to gate scope, with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.
- M. **EXISTING AREA:** The total area of the building structure, core, and envelope that existed when the project area was selected excluding exterior windows and doors.
- N. **EXTENDED PRODUCER RESPONSIBILITY (EPR):** Measures to recover or recycle materials at the end of the useful life of the product for use in new products. Also known as closed-loop program or product take-back program.
- O. **FURNITURE:** Non-permanently affixed products that do not provide structural purpose and may be removed without damage to real property.
- P. **GENERAL EMISSIONS EVALUATION:** Manufacturer's or third-party evaluation confirming required building products have been tested and compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area and state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1-2010.
- Q. **GREEN BUSINESS CERTIFICATION INSTITUTE (GBCI):** Entity providing third-party project LEED certification and professional credentials recognizing excellence in green building performance and practice in support of the USGBC.
- R. **INHERENTLY NON-EMITTING SOURCES:** Products that are inherently non-emitting sources of VOCs (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.
- S. **LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED):** A voluntary green building rating system created and managed by the US Green Building Council (USGBC).

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- T. **LEED ONLINE:** GBCI project management tool where projects are registered, tracked, and submitted to GBCI for project certification. Information, resources, and support are made available to registered projects. Project team members can upload information to credit forms, submit LEED Interpretation (LI) requests, manage key project details, view and respond to reviewer comments.
- U. **MATERIAL COST VALUE:** The dollar value of materials being provided to the project, after any contractor mark-ups and expense to deliver to the site, excluding equipment or labor costs.
- V. **MINIMUM EFFICIENCY REPORTING VALUE (MERV):** Standard method for comparing the efficiency of an air filter, as defined in ASHRAE 52.2-2007. Scale ranges from 1 to 16, which 16 being the most efficient at removing particles from air.
- W. **PERMANENTLY INSTALLED PRODUCT:** In addition to those items that serve structural purposes, permanently installed products are items that are affixed without intention to be removed, either because the item is integral to the walls, ceiling, or floor, or removing the item will cause damage to the building.
- X. **RECYCLED CONTENT:** The recycled content material cost value is determined by weight as a percentage of the total assembly. Recycled content is defined in accordance with ISO Standard 14021
1. **POST-CONSUMER RECYCLED CONTENT:** 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. **PRE-CONSUMER RECYCLED CONTENT:** Material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind and scrap generated in a process and capable of being reclaimed within the same process that generated it.
- Y. **RECYCLING:** Collection, reprocessing, marketing and use of materials that were recovered or diverted from solid waste stream.
- Z. **REGIONALLY SOURCED (EXTRACTED, MANUFACTURED, PURCHASED):** Refers to location where material was extracted, manufactured, purchased. For products containing multiple materials, each material must be calculated separately.
- AA. **RETAINED (REUSED) AREA:** The total area of the building structure, core, and envelope that existed in prior condition and remains in the completed design.
- BB. **REUSE OR REUSED MATERIALS:** Materials, product or portion of a building structure that has been salvaged or refurbished for another use.
- CC. **SALVAGE:** Removal of existing materials or assemblies for re-installation or other use.
- DD. **VOLATILE ORGANIC COMPOUNDS (VOC):** Carbon compounds that participate in atmospheric photochemical reactions, (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures. VOC content is calculated in grams per Liter (g/L) according to 40 CFR 59, Subpart D (EPA method 24).
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EE. WASTE: Extra material or material that has reached end of its useful life in its intended use.

1.5 QUALITY ASSURANCE

- A. Environmental claims must comply with FTC Guidelines for the Use of Environmental Marketing Claims.
- B. Indoor Environmental Quality (EQ) Credit 2: Low-Emitting Materials
 - 1. First-party and third-party manufacturers' claims: Comply with the guidelines in California Department of Public Health (CDPH) SM V1.1–2010, Section 8.
 - a. Organizations that certify manufacturers' claims: Demonstrate accreditation under ISO Guide 65.
 - 2. Laboratories conducting emissions testing for EQ Credit 2: Low-Emitting Materials requirements:
 - a. Demonstrate accreditation under ISO/IEC 17025 for the applicable test methods.

1.6 PRELIMINARY SUBMITTALS

- A. Within 90 days of contract award, based upon the LEED scorecard, submit for approval plans to demonstrate the contractor's approach to the following:
 - 1. Materials and Resources (MR) Prerequisite 2 and Credit 5: Construction and Demolition Waste Management
 - a. Refer to Division 01 Section "Construction and Demolition Waste Management and Disposal."
 - 2. MR Credits 2, 3 and 4: Preliminary LEED Building Product Disclosure and Optimization (BPDO) Calculator indicating that credit requirement(s) will be met based on identified materials.
 - a. MR Credit 2: BPDO - Environmental Product Declarations (EPD)
 - 1) Option 1 - EPD Reports
 - b. MR Credit 3: BPDO - Sourcing of Raw Materials
 - 1) Option 2 - Leadership Extraction Practices Reports
 - c. MR Credit 4: BPDO - Material Ingredients
 - 1) Option 1 - Material Ingredients Reports
- B. Within 60 days of contract award, submit qualifications for designated Contractor LEED Coordinator:
 - 1. Option 1 - Demonstrate experience on at least one LEED Certified project.
 - 2. Option 2 - LEED Green Associate or Accredited Professional (AP) with specialty.
- C. Within 60 days prior to building enclosure, submit for approval, a plan or checklist in compliance with EQ Credit 3: Construction Indoor Air Quality (IAQ) Management Plan.
 - 1. Meet or exceed all applicable control measures of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2nd Edition, 2007, ANSI-SMACNA 008-2008, Chapter 3.
- D. Within 60 days of scheduled construction completion and occupancy, submit for approval, a plan in compliance with EQ Credit 4: IAQ Assessment.
 - 1. Option 2 - IAQ Testing: Provide a schedule describing procedures and dates for testing.

1.7 ACTION SUBMITTALS

- A. Contractor is responsible for completion and transmittal of all construction-related documentation required for LEED certification.
 - 1. Submit for approval information demonstrating LEED compliance.
 - 2. Highlight or circle pertinent LEED information within each submittal.
 - 3. Include all applicable LEED Submittal Forms as the first page(s) of the submittal. These forms are provided at the end of this section.
- B. LT Credit 8: Green Vehicles
 - 1. For electric vehicle supply equipment, documentation indicating:
 - a. Charging capacity.
 - b. Compliance with Society of Automotive Engineers (SAE) standard for electrical connectors.
 - c. Confirmation of network control capabilities.
- C. SS Prerequisite 1: Construction Activity Pollution Prevention
 - 1. 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.
 - a. Include maintenance activities during construction.
- D. SS Credit 6: Light Pollution Reduction
 - 1. Exterior luminaires: Product data indicating backlight, uplight, and glare ratings (BUG).
- E. WE Prerequisite 2: Indoor Water Use Reduction
 - 1. Commercial clothes washers: Product data indicating compliance with CEE Tier 3A.
 - 2. Residential clothes washers: Product data indicating compliance with ENERGY STAR
 - 3. Residential dishwashers (standard and compact): Product data indicating compliance with ENERGY STAR
 - 4. Commercial dishwashers: Product data indicating compliance with ENERGY STAR.
 - 5. Ice machine: Product data indicating compliance with ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
 - 6. Food Steamer: Water usage in gallons per hour per pan
 - 7. Combination Oven: Water usage in gallons per hour per pan
 - 8. Water closet and Urinal: Product data indicating WaterSense Label and flush rate in gallons per flush (gpf)
 - 9. Faucets, aerators and showerheads: Product data indicating WaterSense Label and flow rate in gallons per minute (gpm)
 - 10. Spray rinse valves: Product data indicating flow rate in gallons per minute (gpm)
 - 11. Exception: For renovation projects, existing reused appliances are exempt.
- F. EA Prerequisite 4: Fundamental Refrigerant Management
 - 1. Commercial refrigerators, freezers, ice makers, and water coolers: Product data for refrigerant listed in pounds.
- G. EA Credit 3: Advanced Energy Metering (Alternate)
 - 1. Product data indicating data storage capabilities.

- H. EA Credit 4: Demand Response
 - 1. Product data for interval recording meters.
- I. MR Credit 2: BPDO - EPD
 - 1. Option 1 - EPD: Provide industry-wide EPDs or product-specific EPDs demonstrating ISO 14025 compliance and stating EPD Program Operator.
 - a. Provide documentation of confirming Product Category Rules (PCR) standard EN 15804 or ISO 21930.
 - b. For industry-wide EPD: Include documentation that the manufacturer is recognized participant.
- J. MR Credit 3: BPDO - Sourcing of Raw Materials
 - 1. Option 2 - Leadership Extraction Practices Reports: Documentation demonstrating compliance with one of the following extraction criteria. Include each material cost value.
 - a. Extended Producer Responsibility (EPR) Program, one of the following:
 - 1) Manufacturer-based programs: Brochure or letter from manufacturer describing the EPR program, contact information, proof that product is included in the program.
 - 2) Third-party program: Brochure describing recycling process and average rate of return for the material.
 - b. Bio-based products: Manufacturer letter on company letterhead stating raw material supplier's compliance with Sustainable Agriculture Network's (SAN) Sustainable Agriculture Standard and with ASTM Test Method D6866-12, including a link to a publicly available document confirming SAN compliance, dated within one year of the LEED project registration. Include statement indicating percentage by weight of the total assembly that is bio-based.
 - c. 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.
 - d. Reused Materials: Invoices indicating source and end-use for reused materials.
 - e. Recycled Content: Documentation indicating percentages by weight of total assembly pre-consumer and post-consumer recycled content.
 - f. For products that meet one of the above and are regionally sourced material: Documentation indicating location of extraction, manufacture, purchase of primary raw materials.
- K. MR Credit 4: BPDO - Material Ingredients
 - 1. Option 1 - Material Ingredients Reports: Documentation demonstrating compliance with one of the following:
 - a. Manufacturer Inventory
 - b. Health Product Declaration (HPD)
 - c. Cradle to Cradle (C2C) v2 Basic level or v3 Bronze level
 - d. Cradle to Cradle Material Health Certificate: Bronze level or higher
 - e. Declare Product Database
 - f. UL's Product Lens Certification
 - g. ACT's Facts Certification
- L. Materials and Resources (MR) Credit 5: Construction and Demolition Waste Management

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1. Waste Management Progress Reports: Refer to Division 01 Section "Construction and Demolition Waste Management and Disposal."
- M. EQ Credit 1: Enhanced Indoor Air Quality Strategies
1. For wall-mounted carbon dioxide sensors: Documentation indicating accuracy in percent.
- N. EQ Credit 2: Low-Emitting Materials
1. General Emissions Evaluation: Provide manufacturer product data indicating emissions certification in compliance with California Department of Public Health (CDPH) Standard Method v1.1–2010 for the following building materials.
 - a. Paints and coatings wet-applied within the building interior
 - 1) Include volume of material applied per product.
 - b. Adhesives and sealants wet-applied within the building interior
 - 1) Include volume of material applied per product.
 - c. Flooring installed within the building interior
 2. Formaldehyde Evaluation: For batt insulation installed within the building interior, provide manufacturer product data indicating that products do not contain added formaldehyde, phenol formaldehyde, or urea-extended phenol formaldehyde.
 3. Composite Wood Evaluation: For composite wood permanently installed within the building interior, provide manufacturer product data indicating one of the following:
 - a. Certification of compliance with California Air Resources Board (CARB), Airborne Toxic Control Measures (ATCM), Phase II, for ultra-low-emitting formaldehyde (ULEF) resins.
 - b. No added formaldehyde (NAF) resin
 4. Furniture Evaluation: For furniture installed within the building interior, provide manufacturer product data indicating compliance with the following.
 - a. ANSI/BIFMA M7.1-2011 testing protocols
 - b. ANSI/BIFMA e3-2010 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2
 - c. For classroom furniture, provide documentation indicating the modeling scenario to determine compliance
 5. Volatile Organic Compound (VOC) Content: Provide manufacturer product data indicating VOC content as measured in grams per Liter (g/L).
 - a. For wet-applied adhesives, sealants, paints and coatings applied within the building interior
- O. EQ Credit 3: Construction IAQ Management
1. Provide manufacturer product data indicating MERV rating of temporary and final filtration media.
 - a. Include dates and locations of all filter replacement installations.
 2. 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.
 - a. Alternatively, provide a narrative demonstrating how the IAQ Plan was implemented and describing the protection of materials from moisture damage.
- P. IN Credit 1: Reduced Mercury in Lamps
1. Product data for all mercury-containing lamps, indicating mercury content in milligrams, mean lumen output, and lamp life in hours.
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1.8 INFORMATIONAL SUBMITTALS

- A. With each Application for Payment, submit progress reports using the BPDO Calculator for the following:
 - 1. MR Credit 2: BPDO – EPD
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - 3. MR Credit 4: BPDO - Material Ingredients
- B. With each Application for Payment, submit progress reports using the EQ Credit 2: Low-Emitting Materials Calculator.

1.9 CLOSEOUT SUBMITTALS

- A. Location and Transportation (LT) Credit 3, Option 3: At completion of brownfield remediation provide the following.
 - 1. Documentation from the authority having jurisdiction declaring existence of specific water or soil contamination.
 - 2. Documentation from the authority having jurisdiction declaring remediation has been or will be completed to its satisfaction.
- B. LEED Online: At completion of construction and prior to contract closeout, complete the LEED Online Form and upload the associated required documentation to the LEED Online Project Database for the following.
 - 1. LT Credit 3: High Priority Site
 - 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
- C. 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.

1.10 CONTRACTOR LEED COORDINATOR

- A. Designate one employee or consultant as the Contractor LEED Coordinator for this Project.
 - 1. Maintain access to LEED Online at project award and throughout project.
 - 2. Document all credits assigned to the Contractor.
 - 3. Attend all LEED meetings.

1.11 CONSTRUCTION MEETINGS

- A. Pre-construction Conference: Contractor will schedule a LEED coordination conference at a time convenient to Owner, Architect, and Contractor.
 - 1. Attendees: Authorized representatives of Owner, Architect, Contractor and its superintendent and LEED Coordinator; and other concerned parties as appropriate.

2. Agenda: Discuss items of significance that could affect meeting LEED requirements, including the following:
 - a. LEED Scorecard and required certification level.
 - b. Role of Contractor LEED coordinator.
 - c. General requirements for LEED-related procurement and documentation, including the LEED submittal review process.
 - d. Erosion and sedimentation control.
 - e. Commissioning participation and coordination.
 - f. Construction waste management.
 - g. Indoor air quality management.
 - h. Project closeout requirements and LEED certification procedures.
- B. Include the status of LEED green building-related work on the agenda of all required regularly scheduled job-site meetings.

PART 2 - PRODUCTS

2.1 ELECTRIC VEHICLE SUPPLY EQUIPMENT

- A. Charging Capacity: Minimum Level 2 (208 – 240 volts).
- B. Electrical Connectors: Comply with SAE Surface Vehicle Recommended Practice J1772 or SAE Electric Vehicle Conductive Charge Coupler.
- C. Control: Network or internet addressable, capable of participating in a demand-response program or time-of-use pricing.

2.2 EXTERIOR LIGHTING

- A. Backlight and Glare Rating: Maximum based on the following:

	MLO Lighting Zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
Luminaire Mounting	Allowed Backlight Ratings				
> 2 mounting height (mh) from lighting boundary (lb)	B1	B3	B4	B5	B5
1 to 2 mh from lb and properly oriented (ph)	B1	B2	B3	B4	B4
0.5 to 1 mh to lb and ph	B0	B1	B2	B3	B3
< 0.5 mh to lb and ph	B0	B0	B0	B1	B2
	Allowed Glare Ratings				
Building-mounted (Bm) > 2 mh from any lb	G0	G1	G2	G3	G4
Bm 1-2 mh from any lb	G0	G0	G1	G1	G2
Bm 0.5 to 1 mh from any lb	G0	G0	G0	G1	G1
Bm < 0.5 mh from any lb	G0	G0	G0	G0	G1
All other luminaires	G0	G1	G2	G3	G4

- B. Uplight Rating: Maximum based on the following:

MLO Lighting Zone				
LZ0	LZ1	LZ2	LZ3	LZ4
Allowed Uplight Ratings				
U0	U1	U2	U3	U4

2.3 ENVIRONMENTAL PRODUCT DECLARATION (EPD)

- A. Provide at least 20 different permanently installed products sourced from at least five different manufacturers that demonstrate one of the following declarations for at least cradle to gate scope.
1. Product-specific declaration that is publicly available, critically reviewed, with life-cycle assessment conforming to ISO 14025 at a minimum: Contribute to LEED MR credit calculations as one quarter (1/4) of a product.
 2. Environmental Product Declaration: In addition to conforming to ISO 14025, products may conform to ISO 14040 and /or 14044, and must conform to Product Category Rules (PCR) standard EN 15804 or ISO 21930.
 - a. Industry-wide (generic) EPD: Contribute to LEED MR credit calculations as one half (1/2) of a product.
 - 1) Single industry-wide (generic) EPD: Contributes for up to ten products listed within the industry-wide EPD, provided that each application has separately reported impacts within the EPD.
 - a) Product manufacturer must be recognized participant by the program operator.
 - b. Product-specific Type III EPD: Contribute to LEED MR credit calculations as one whole product.
 - c. Furniture and other non-building products not addressed by PCR standard EN 15804 or ISO 21930, conformance only to ISO 14025 is acceptable.

2.4 LEADERSHIP EXTRACTION PRACTICE

- A. Provide at least 25 percent, by material cost value, of the total value of permanently installed products in the project that demonstrate one the following:
1. EPR: Product purchased from a manufacturer that participates in an EPR program or is directly responsible for the program: Contribute to LEED MR credit calculations at 50 percent of the material cost value.
 2. Bio-based products: Contribute to LEED MR credit calculations at 100 percent of the material cost value.
 3. Wood products certified by Forest Stewardship Council (FSC): Contribute to LEED MR credit calculations at 100 percent of the material cost value.
 - a. FSC Pure and FSC Mixed Credit are valued at 100 percent of material cost value.
 - b. FSC Mixed (NN) percent are valued at indicated percentage of their cost value.
 - c. FSC Recycled and FSC Recycled Credit contribute 100 percent post-consumer recycled content value (not as certified wood).
 - d. FSC bamboo-based products contribute to this credit.
 4. Reused materials: Contribute to LEED MR credit calculations at 100 percent of the material cost value.

5. Recycled content products: Contribute to LEED MR credit calculations at 100 percent of the material cost value.
 - a. Calculate recycled content as the sum of a product's post-consumer recycled content plus one half (1/2) of the pre-consumer recycled content.
- B. In addition to the credit base criteria, products that are regionally sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site: Contribute to LEED MR credit calculation at 200 percent of material cost value.
 1. Before this regional source multiplier is applied to LEED MR credit calculations, a product material cost value must not exceed 100 percent.
 2. Single product components compliant with multiple responsible extraction criteria contribute only once to LEED MR credit calculations.
 3. No single product contributes more than 200 percent of material cost value to LEED MR credit calculations.
- C. Calculate material cost value per LEED guidelines for MR credits.
 1. Include Divisions 03-10 and 31-32 products. plus any contributing passive products from Divisions 11, 21-28.
 - a. Passive products are not part of the active portions of the system, such as ductwork and conduit.
 2. Include Division 12 products that are permanently installed products such as built-in casework.
 - a. Division 12 moveable furniture may be included if consistently included in MR Credits.
 3. Include all expenses to deliver material to the Project Site incurred by the Contractor including taxes and transportation costs.
 4. Exclude installation labor and equipment, mechanical, electrical and plumbing components and specialty items such as elevators.

2.5 MATERIAL INGREDIENT REPORTING

- A. Provide at least 20 different permanently installed products sourced from at least five different manufacturers that demonstrate at least one of the following chemical inventory programs to at least one tenth percent (0.1%) or 1000 parts per million (ppm) of the end use product:
 1. Published Manufacturer Content Inventory demonstrating one of the following.
 - a. Publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN).
 - b. Materials defined as trade secret of intellectual property: Disclose role, amount and hazard screen using one of the following:
 - 1) GreenScreen benchmark as defined in GreenScreen v1.2
 - 2) Global Harmonized System (GHS) of Classification and Labeling Chemicals rev. 6 (2015)
 2. Health Product Declaration (HPD): Demonstrate full disclosure of known hazards in compliance with the HPD Open Standard and published in the HPD Public Repository.
 3. Cradle to Cradle v2 Basic level or Cradle to Cradle v3 Bronze level
 4. Cradle to Cradle Material Health Certificate: Bronze level or higher, at least 90 percent of materials assessed by weight.
 5. Declare Product Database: Demonstrate all ingredients evaluated and disclosed to 1000 parts per million.
 6. UL's Product Lens Certification

7. ACT's Facts Certification (NSF /ANSI 336-2011): Demonstrate any certification level.

2.6 LOW-EMITTING MATERIALS

- A. General Emissions Evaluation: Provide the following materials compliant with emissions testing in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario.
 1. Paints and coatings wet-applied to walls, floors and ceilings within the building interior: Provide at least 90 percent of products in compliance.
 2. Adhesives and sealants wet-applied within the building interior: Provide at least 90 percent of products in compliance.
 3. Flooring installed within building interior.
- B. Composite wood permanently installed within the building interior: Comply 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. Batt insulation installed within the building interior: Do not contain added urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.
- D. New furniture and furnishings installed within the building interior: Provide at least 90 percent, by cost, in compliance with the testing procedure requirements of ANSI/BIFMA M7.1-2011 testing protocols and in compliance with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 or 7.6.2 using either the concentration modeling approach or the emissions factor approach.
 1. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate.

-
2. For classroom furniture, use the standard school classroom model in CDPH Standard Method v1.1.
 3. Exemption: Salvaged and used furniture more than one year old
- E. 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,” July 1, 2005, 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
- F. Sealants wet-applied within building interior: Comply with VOC content limits, as expressed in grams per Liter, less water and exempt compounds, of SCAQMD Rule 1168 “Adhesive and Sealant Applications,” July 1, 2005.
1. Architectural Sealants: 250
 2. Other: 420
- G. Sealant primers wet-applied within building interior: Comply with VOC content limits, as expressed in grams per Liter, less water and exempt compounds, of SCAQMD Rule 1168 “Adhesive and Sealant Applications,” July 1, 2005.
1. Architectural, Nonporous: 250
 2. Architectural, Porous: 775
 3. Other: 750
- H. 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,” June 3, 2011.
-

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: 150
12. Fire Resistive Coatings: 350
13. Floor Coatings: 50
14. Form-Release Compounds: 250
15. Graphic Arts (sign) Coatings: 500
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: 500
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

- I. 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.
- J. Methylene chloride and perchloroethylene: Prohibit in paints, coatings, adhesives, or sealants.

2.7 AIR FILTRATION MEDIA

- A. Temporary filtration media: Filtration media rated for minimum efficiency reporting value (MERV) of 8 minimum, when tested in accordance with ASHRAE 52.2-2007.
 - 1. Alternative Compliance Path: Provide Class F5 or higher filtration media, in accordance with CEN Standard EN 779–2002.
- B. 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.
 - 1. Alternative Compliance Path: Provide Class F7 or higher filtration media, in accordance with CEN Standard EN 779–2002.

2.8 CLEANING PRODUCTS AND EQUIPMENT

- A. Give preference to Green Seal qualified spot removers and cleaning agents for each given application.
- B. Use HEPA-filter equipped vacuum cleaners for the final cleaning.

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 building flush-out or 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. Option 2 - 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 Building 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 schools: 5000 square feet.
8. Maximum testing area for gymnasiums: 50,000 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.
9. Collect air samples between 3 feet and 6 feet from the floor.
10. Demonstrate the following maximum contaminant concentration levels:

Chemical Contaminant	Maximum Concentration	ASTM and EPA Methods	ISO Method
Carbon Monoxide (CO)	9 parts per million and no greater than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224
Formaldehyde	27 parts per billion	ASTM D5197; EPA TO-11; EPA Compendium IP-6	ISO 16000-3
Particulates (PM10)	50 micrograms per cubic meter	EPA Compendium Method IP-10	ISO 7708
Particulates (PM 2.5) For buildings in EPA nonattainment areas or local equivalent	15 micrograms per cubic meter	EPA Compendium Method IP-10	ISO 7708
Ozone For buildings in EPA nonattainment areas	0.075 parts per million	ASTM D5149-02	ISO 13964
Total volatile organic compounds (TVOC)	500 micrograms per cubic meter	EPA TO-1, TO-17 or EPA Compendium Method IP-1	ISO 16000-6
Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde	Cal/EPA OEHHA full CREL (June 2014)	ASTM D5197; EPA TO-1, TO-17	ISO 16000-3, 16000-6

3.8 ATTACHMENTS

- A. LEED SCORECARD
- B. LEED v4 MATERIALS AND RESOURCES SUBMITTAL FORM, BPDO: Environmental Product Declarations, Option 1
- C. LEED v4 MATERIALS AND RESOURCES SUBMITTAL FORM, BPDO: Sourcing of Raw Materials, Option 2
- D. LEED v4 MATERIALS AND RESOURCES SUBMITTAL FORM, BPDO: Material Ingredients, Option 1
- E. LEED v4 LOW-EMITTING MATERIALS SUBMITTAL FORM

END OF SECTION

LEED v4 BD+C: Schools

Project Scorecard

Project Information Form					
Y	?Y	?N	N		
Y				P1f1	Project Information
1				Integrative Process	Possible Points 1
Y	?Y	?N	N		
1				IPc1	Integrative Process 1
8			9	Location and Transportation	Possible Points 15
Y	?Y	?N	N		
				LTc1	LEED for Neighborhood Development Location 15
2				LTc2	Sensitive Land Protection +1 [RP] 1
2				LTc3	High Priority Site 2
2			3	LTc4	Surrounding Density and Diverse Uses 5
			4	LTc5	Access to Quality Transit 4
1				LTc6	Bicycle Facilities 1
			2	LTc7	Reduced Parking Footprint +1 [RP] 1
1				LTc8	Green Vehicles 1
7		2	4	Sustainable Sites	Possible Points 12
Y	?Y	?N	N		
Y				SSp1	Construction Activity Pollution Prevention
Y				SSp2	Environmental Site Assessment
1				SSc1	Site Assessment 1
			2	SSc2	Site Development: Protect or Restore Habitat [RP] 2
1				SSc3	Open Space 1
3			1	SSc4	Rainwater Management +1 [RP] 3
			2	SSc5	Heat Island Reduction 2
1				SSc6	Light Pollution Reduction 1
			1	SSc7	Site Master Plan 1
1				SSc8	Joint Use of Facilities 1
3			9	Water Efficiency	Possible Points 12
Y	?Y	?N	N		
Y				WEp1	Outdoor Water Use Reduction
Y				WEp2	Indoor Water Use Reduction
Y				WEp3	Building-Level Water Metering
2				WEc1	Outdoor Water Use Reduction 2
			7	WEc2	Indoor Water Use Reduction [RP] 7
			2	WEc3	Cooling Tower Water Use 2
1				WEc4	Water Metering 1
11	4	2	14	Energy and Atmosphere	Possible Points 31
Y	?Y	?N	N		
Y				EAp1	Fundamental Commissioning and Verification
Y				EAp2	Minimum Energy Performance
Y				EAp3	Building-Level Energy Metering
Y				EAp4	Fundamental Refrigerant Management

[RP] - Regional Priority credit (1 addn't pt) Zip Code: 21704

2 Design Credit likely to be achieved; calculations and/ or discussion w/ FCPS required.

Urbana Elementary School Replacement

Grimm + Parker
January 2, 2019



Energy & Atmosphere, cont.					
Y	?Y	?N	N		
5			1	EAc1	Enhanced Commissioning 6
6	2	2	6	EAc2	Optimize Energy Performance 16
	1			EAc3	Advanced Energy Metering 1
			1	EAc4	Demand Response 2
			3	EAc5	Renewable Energy Production 3
			1	EAc6	Enhanced Refrigerant Management 1
			2	EAc7	Green Power and Carbon Offsets 2
6	3		5	Materials and Resources	Possible Points 13
Y	?Y	?N	N		
Y				MRp1	Storage & Collection of Recyclables
Y				MRp2	Construction and Demolition Waste Management Planning
		3	2	MRc1	Building Life-Cycle Impact Reduction 5
1			1	MRc2	BPDO: Environmental Product Declarations 2
2			1	MRc3	BPDO: Sourcing of Raw Materials +1 [RP] 2
1			1	MRc4	BPDO: Material Ingredients 2
2				MRc5	Construction and Demolition Waste Management 2
8	2		6	Indoor Environmental Quality	Possible Points 16
Y	?Y	?N	N		
Y				EQp1	Minimum IAQ Performance
Y				EQp2	Environmental Tobacco Smoke Control
Y				EQp3	Minimum Acoustic Performance
2				EQc1	Enhanced Indoor Air Quality Strategies 2
1	1		1	EQc2	Low-Emitting Materials 3
		1		EQc3	Construction Indoor Air Quality Management Plan 1
2				EQc4	Indoor Air Quality Assessment 2
1				EQc5	Thermal Comfort 1
1			1	EQc6	Interior Lighting 2
			3	EQc7	Daylight 3
1				EQc8	Quality Views 1
			1	EQc9	Acoustic Performance 1
5	1			Innovation	Possible Points 6
Y	?Y	?N	N		
		1		INc1.1	Pilot Credit - TBD 1
1				INc1.2	Purchasing: Lamps 1
1				INc1.3	Occupant Comfort Survey 1
1				INc1.4	LEED O+M Starter Kit 1
1				INc1.5	The School as a Teaching Tool 1
1				INc2	LEED Accredited Professional 1
49	10	4	47	Total	Possible Points 110

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

27 Design Credit

7 Design Credit documented on LEED Online

15 Construction Credit

Credits impacted by Dashboard decision.

LEEDv4 INDOOR ENVIRONMENTAL QUALITY SUBMITTAL FORM

Low-Emitting Materials

[illegible]


LEEDv4 MATERIALS AND RESOURCES SUBMITTAL FORM
BPDO: Environmental Product Declarations (EPD), Option 1

PROJECT: DATE:		SUBMITTAL NUMBER: CSI SECTION NUMBER:								
Note: Contractor to complete this form and submit with product data to verify the claims for each product specified as subject to LEED compliance.	Product-Specific Declaration LCA ISO 14044 (1)		EPD Industry-Wide (2)		EPD (Type III) Product-Specific (3)		EPD Program Operator		ISO Standard(s)	
Manufacturer & Product/ Model Name	Name	Page #	Name	Page #	Name	Page #	Name	Page #	Number	Page #
1. Product-specific declaration that is publicly available, critically reviewed, with life-cycle assessment conforming to ISO 14025 at a minimum: Contribute to LEED MR credit calculations as one quarter (1/4) of a product.										
2. In addition to conforming to ISO 14025, products may conform to ISO 14040 and /or 14044, and must demonstrate Product Category Rules (PCR) standard EN 15804 or ISO 21930. Industry-wide (generic) EPDs contribute to LEED MR credit calculations as one half (1/2) of a product.										
3. Product-specific Type III EPD: Contribute to LEED MR credit calculations as one whole product										
Notes/Clarifications:										
Certification provided by: Title: Company:			Address: Phone:							

LEEDv4 MATERIALS AND RESOURCES SUBMITTAL FORM
BPDO: Sourcing of Raw Materials, Option 2

[illegible]

LEEDv4 MATERIALS AND RESOURCES SUBMITTAL FORM
BPDO: Material Ingredients, Option 1

PROJECT: DATE:		SUBMITTAL NUMBER:	
Note: Contractor to complete this form and submit with product data to verify the claims for each product specified as subject to LEED compliance.		Opt. 1: Reporting (1)	
Manufacturer & Product/ Model Name	Type	Page #	
1. Options for demonstrating reporting: a. Publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN). b. Materials defined as trade secret of intellectual property: Disclose role, amount and hazard screen - GreenScreen v1.2 OR Globally Harmonized System (GHS). c. Health Product Declaration (HPD) with full disclosure of known hazards in compliance with the HPD Open Standard and published in the HPD Public Repository. d. Cradle to Cradle v2 Basic level or Cradle to Cradle v3 Bronze level. e. Cradle to Cradle Material Health Certificate: Bronze level or higher, at least 90 percent of materials assessed by weight. f. Declare Product Database : Demonstrate all ingredients evaluated and disclosed to 1000 parts per million g. UL's Product Lens Certification. h. ACT's Facts Certification (NSF /ANSI 336-2011).			
Notes/Clarifications:			
Certification provided by: Title: Company:	Address: Phone:		
			

SECTION 01 19 13 – 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 08 00 - Mechanical System Commissioning" and "23 08 59 – 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 08 00 as well as in individual Division 23 Sections.
 2. Building Automation Systems (BAS): Requirements for commissioning are specified in Section 23 08 59.
 3. Electrical Systems: Requirements for commissioning are specified in Section 26 08 00

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 40 00 – Quality Control: Specifies the contractor’s requirements and responsibilities for testing and re-testing.
- C. Section 01 33 00 – Submittals: Addresses documentation and procedures relative to the commissioning process, including Operation and Maintenance Manuals.
- D. Section 01 50 00 – Temporary Utilities: Specifies the requirements for using Owner’s existing and/or permanent equipment and controls for temporary conditioning in the facility.
- E. Section 01 77 00 – Project Close Out: Defines the milestones in completion incorporating the commissioning process.
- F. Section 01 81 13 – Sustainable Design Requirements: Provides LEED™ requirements for the project delivery.
- G. Section 01 91 15 – 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 08 59 – Building Automation Systems Commissioning: Details the commissioning procedures specific to the Building Automation System.
- J. Section 23 08 00 – 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 (Cx/T): 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 4-2008, "Preparation of Operating and Maintenance Documentation for HVAC&R Systems"
- C. NEBB - Procedural Standards for Whole Building Systems Commissioning of New Construction
- D. LEED v4 for Building Design and Construction released in 2013.

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 08 59. 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 (CxC) 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 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 08 59.
 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 08 00 and the Cx 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 91 15.

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 insuring 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 full contents of the *Facility Manual* as shown can be quite expensive to generate. The Editor should carefully weigh the project requirements and budget against these items. This is particularly true for the optional clauses bracketed. Experience has generally shown that Contractors are ill-equipped to provide a manual to the extent required below. If the Owner wants this, they should consider having the A/E or the Cx Authority do this. However, this is left in here as it represents a consolidation of ASHRAE Guideline 4 and OMSI documents which are OM Guide Standards.

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. Contact Directory: Include the contact information for all contractors, subcontractors, vendors, manufacturers, and any other entity that has provided goods or services installed at the facility. Contact information should include name, website, address, phone numbers, and technical support phone numbers and email addresses.
 - 3. General Facility and System Description: [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).
 - 4. Floor Plans: [A/E] Provide uncluttered, legible 11 by 17-inch floor plans. Exact copies of the design plans are usually not acceptable because of extraneous information. Include

only room numbers, type or function of spaces, and overall facility dimensions on the floor plans. Do not include construction instructions, references, frame numbers, etc.

5. 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.
 6. Warranty Information: CM shall provide all warranties indexed in a logical order.
- 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. Contact Information [CM]: Provide contact cross-references to the Parties applicable to the system being described and contained in the main Contact Directory in Part 1.
3. 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. Note that a compilation of non-integrated flow diagrams for the individual system components is not acceptable.
4. Diagrammatic Plans [A/E]: Provide floor plans indicating the location of equipment and configuration of the system installation. Include the configuration of associated piping or wiring, subordinating structural features to utility features.
5. Startup and Shutdown Procedures [GC]: 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.
6. Normal Operating Instructions [GC]: 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.
7. Emergency Operating Instructions [GC]: 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.
8. Environmental Considerations [GC]: 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.

9. Equipment and System Training Documentation [GC]: Include documentation of training for applicable system. Include training agenda, all handouts and presentation materials/content. Reference existence and index of DVD or video tape recording.
10. Sequence of Operation/Control Schematic [A/E]: Provide the written sequence of operation for the applicable system and the control schematic diagram.
11. Maintenance Service Agreements [GC]: Provide copies of maintenance service agreements where there pertain to systems involving multiple components and devices as indexed in Part 3.
12. Balancing Reports [GC]: 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 [GC]: 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 Facilities 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.
- m) Application and Installation Instructions: Where applicable and separate from the O&M instructions, provide the Application and Installation Instructions that indicate how to correctly apply and install/setup the equipment.

D. Manual Section 4 - Construction Documentation

- 1. Record Drawings [A/E]: Provide an index of all record drawings with drawing number, title, and electronic file name(s) including electronically referenced drawings.
- 2. Record Specifications [A/E]: Provide a detailed index of the record specification. Include sections and major items in the specification all indexed to the appropriate page number.
- 3. Approved Product Data and Shop Drawings [A/E]
 - a) Provide an index of all product data and shop drawings. This shall list all equipment with the associated submittal number
 - b) Organize and compile only APPROVED product data and shop drawings. Providing these in a filing format is acceptable provided all files are identified and organized for easy access.
 - c) Inclusion of any of this information in previous sections of the Facilities Manual does not allow exclusion in this section.
- 4. Commissioning Record [CA]: Provide complete commissioning records including all Startup Procedures and Functional Performance Test documentation.

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 08 00 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 08 00.

PART 3 EXECUTION

3.01 Functional performance Test Execution

- A. Functional Performance Testing procedures are specified in Section 01 91 15. Contractor shall participate in the development of the testing procedures as needed.

END OF SECTION

SECTION 01 19 15 – FUNCTIONAL PERFORMANCE TESTING PROCEDURES**PART 1 GENERAL****1.01 WORK INCLUDED**

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

1.02 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.

1.03 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 91 13: Specifies the general facility commissioning procedures common across all Divisions and the Contractor's responsibilities for the commissioning process.
- C. Section 23 08 59 – Building Automation Systems Commissioning: Details the commissioning procedures specific to the Building Automation System.
- D. Section 23 08 00 – 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.

1.04 Definitions and Abbreviations

- A. Refer to Section 01 91 13.

1.05 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.

1.06 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

1.07 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 08 59.
 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

2.01 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)

3.01 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.

3.02 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.

3.03 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

3.04 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.

3.05 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.

3.06 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.

3.07 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.

3.08 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

3.09 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 08 59 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. Insure lights are banked parallel to the daylight source.

END OF SECTION

SECTION 02 30 00 - SUBSURFACE DRILLING AND SAMPLING INFORMATION**PART 1 GENERAL**

- 1.1 The following information is included in the Project Manual for bidders' use in preparing bids, but is not part of the Contract Documents, and does not relieve the bidders from doing their own investigation to determine the accuracy of the information.

- A. Stage 1 Geotechnical Engineering Report, Urbana Elementary School Replacement, ECS Project Number 13:8624; dated July 3, 2018.
- B. Urbana Elementary School Replacement - Phase II, ECS Project Number 13:8624-A; dated December 31, 2018.

1.2 **STATEMENT CONCERNING THE BORING DATA**

- A. The test borings and samples of the soils encountered were obtained by the Architect to assist the Architect and his consultants in determining the type and design of the foundation systems.
- B. The test borings were made by ECS Mid-Atlantic, LLC, in accordance with their system of soils classification and they, ECS Mid-Atlantic, LLC, neither the Owner, the Architect, or his consultants guarantee the accuracy or consistency of the information contained within the Geotechnical Report with the actual site conditions.
- C. Any radical deviation from the anticipated material, as indicated by the borings, during the excavation for the building should be reported to the Architect immediately and confirmed in writing.

1.3 **CONFIRMATION OF BORING DATA**

- A. Bidders, Contractors, and any others who are concerned with, or are affected by the test borings should make their own borings and tests at the site.
- B. No additional compensations will be allowed the Contractor for failure to fully investigate the site or for the neglect of the information contained in the Boring Logs.

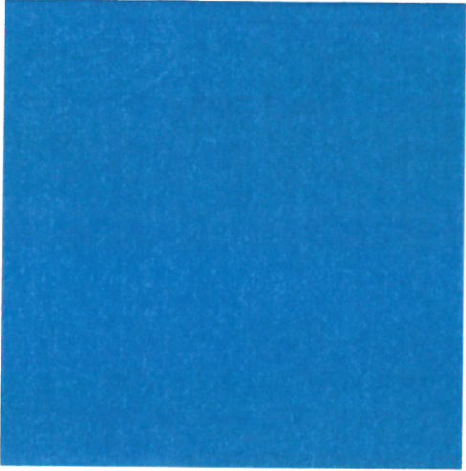
1.4 **ATTACHMENT**

- A. Stage 1 Geotechnical Engineering Report, Urbana Elementary School Replacement, ECS Project Number 13:8624; dated July 3, 2018.
- B. Urbana Elementary School Replacement - Phase II, ECS Project Number 13:8624-A; dated December 31, 2018.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



ECS Mid-Atlantic, LLC

Preliminary Geotechnical Engineering Report

Urbana Elementary School Replacement

3554 Urbana Pike
Urbana, Maryland

ECS Project Number 13:8624

July 3, 2018





July 3, 2018

Ms. Kristy Price
Grimm and Parker
11720 Beltsville Drive
Suite 600
Calverton, Maryland 20705

ECS Project No. 13:8624

Reference: Preliminary Geotechnical Engineering Report
Urbana Elementary School Replacement
3554 Urbana Pike
Frederick, Frederick County, Maryland

Dear Ms. Price:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration and preliminary geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 13:9763-GP, dated April 17, 2018 and revised on April 23, 2018. This report presents our understanding of the geotechnical aspects of the project, along with the results of the field exploration and our design and construction recommendations.

It has been our pleasure to be of service to Grimm and Parker during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Mid-Atlantic, LLC

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Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No.: 30901 Expiration Date: 08/15/2020

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APPENDICES

Appendix A – Drawings & Reports

- Site Location Diagram
- Boring Location Diagram
- Geologic Map
- Soil Survey Map

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- Boring Logs (B-1 through B-8, I-1 through I-5, RW-1, and RW-2)
- Infiltration Test Results

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- Laboratory Test Results Summary
- Plasticity Chart
- Grain Size Analysis
- Moisture-Density Relationship Curves

EXECUTIVE SUMMARY

The following summarizes the main findings of the preliminary exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire preliminary geotechnical report.

- The preliminary geotechnical exploration performed for the planned development included fifteen (15) soil test borings drilled to depths of approximately 10 to 20 feet below existing grades.
- Beneath the surface cover, existing, undocumented fill materials were encountered in eight (8) borings extending to depths of up to approximately 8.5 feet below existing grade. Natural soils were encountered below the surface cover and fill materials with the natural soils extending to depths of up to 20 feet. The natural soils were classified as SILT (ML), CLAY (CL), SAND (SM), and GRAVEL (GP-GM).
- The planned school building can be supported by conventional shallow foundations consisting of individual column footings and continuous wall footings bearing on soils improved by aggregate piers. Details of the assumed foundation subgrade elevations and loads are contained in the body of the report. Foundations bearing over aggregate piers can be designed for a net allowable bearing pressure of 5,000 to 7,000 psf.
- The soils described above are generally expected to be suitable for reuse as engineered fill. Some of the on-site CL materials have elevated plasticity outside of the suitable limits for immediate reuse in structural areas. Moisture conditioning of subgrades and fill lifts may be required.
- Groundwater was encountered in boring B-4 at a depth of 13.5 feet below existing grades (EL 396.5). The remaining boring locations were observed to be dry. Given the assumed finished floor level of up to 10 feet below existing grades, groundwater is not anticipated to be an issue in most areas of the site.
- Infiltration rates of 0.06 to 0.72 inches per hour were measured in the infiltration test holes at 5 to 10 feet below existing grades.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this preliminary study was to provide geotechnical information for the design of building foundations and planned earthwork associated with the replacement of the existing school. The project will include the construction of a new 2-story school building with associated site retaining walls, paved roadways, and stormwater management facilities.

The recommendations developed for this report are based on project information supplied by Grimm and Parker. This report contains the results of our subsurface explorations, site characterization, preliminary engineering analyses, and recommendations for the design and construction of planned residences and associated site improvements.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the new school building, retaining walls, roadways, and stormwater management facilities, fifteen (15) soil test borings were performed at locations selected by the structural engineer (Wolfmann & Associates) and civil engineer (ADTEK). These borings were located within the footprint of the proposed building, retaining wall, and stormwater management facility locations. A laboratory-testing program was also implemented to characterize the physical and engineering properties of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field and laboratory test procedures.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our test boring logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.
- Recommended foundation type(s).
- Evaluation and recommendations relative to groundwater control.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 13:9673-GP, dated April 17, 2018 and revised on April 23, 2018, and authorized by Grimm and Parker on May 15, 2018, which includes the Terms and Conditions of Service.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located on the southwest side of Urbana Pike, west of the intersection at Urbana Church Road, in Urbana, Maryland. Specifically, the site is bounded to the northwest by Urbana Fire & Rescue Services, to the northeast by Urbana Pike, on the southeast by single family homes along Urbana Pike and wooded land, and to the southwest by Interstate 270.

Figure 2.1.1 below, shows the approximate project location. A Site Location Diagram has been included as Figure 1 in Appendix A.

Figure 2.1.1 Site Location



2.2 PAST SITE HISTORY/USES

According to online historic aerial imagery, the site was in use previously as agricultural and wooded land until 1959. The existing school structure was constructed in 1959, with subsequent additions in 1965 and 1975.

2.3 CURRENT SITE CONDITIONS

The northern portion of the site is currently occupied by the existing school building, portable classrooms, and asphalt paved parking areas and drive lanes. The southern portion of the site is currently open grassed land and athletic fields. The site can be considered relatively flat to slightly sloping with existing site grades ranging from approximately EL 454 along Urbana Pike to EL 433 near the solar array in the east central portion of the site (extent of limits of disturbance).

2.4 PROPOSED CONSTRUCTION

The project will consist of the demolition of the existing school and site infrastructure and construction of a new two-story school building. Planned site improvements will include new paved parking and drive lanes and stormwater management facilities.

The site is relatively flat to slightly sloping and the planned new school building will have a finished floor level similar to the existing structure, therefore only minimal cuts and fills will be required within a majority of the new building footprint. Fills on the order of 10 feet will be necessary in the southwest portion of the new building. No further details regarding the planned site development activities were available at this time.

2.4.1 Site Civil Features

Multiple stormwater management features, likely consisting of micro bio-retention and infiltration trenches will be constructed around the site. Specific details regarding the size and depth of these facilities was not available at the time of this report.

Two (2) site retaining walls are indicated on the site plan provided to us. Overall wall heights were not provided, however we have assumed the walls will have exposed heights of less than 10 feet.

2.4.2 Structural Information/Loads

The following information explains our understanding of the structures and their loads:

Table 2.4.2.1 Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Building Footprint	The square footage of the planned school building was not provided.
# of Stories	2-story above grade (no below grade levels).
Usage	Elementary School
Framing	Slab on grade with structural steel framing and masonry bearing walls.
Column Loads	150 kips (Provided by Wolfman & Associates)
Wall Loads	5 kips per linear foot (klf) maximum (Provided by Wolfman & Associates)
Lowest Finish Floor Elevation	EL 446

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

3.1.1 Test Borings

The subsurface conditions were explored by drilling eight (8) soil test borings within the proposed building footprint, two (2) borings within the proposed retaining wall areas, and five (5) borings at proposed stormwater management facility locations. An all-terrain vehicle (ATV)-mounted drill rig was utilized to drill the soil test borings. Borings were generally advanced to depths of 10 to 20 feet below the current ground surface. Subsurface explorations were completed under the general supervision of an ECS geotechnical engineer or geologist.

Additional borings will be drilled once the existing school is demolished and removed.

Boring locations were identified in the field by ECS personnel using GPS prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the site plan provided to us, as prepared by ADTEK.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility. Bulk samples taken from the upper 2 to 8 feet of subsurface soils at several boring locations were obtained for subsequent laboratory testing.

3.1.2 Storm Water Infiltration Testing

In order to evaluate potential infiltration at this property, in-situ infiltration tests were performed in offset holes adjacent to test boring locations I-1 through I-5. The infiltration testing was performed at depths of 4.8 to 9.8 feet below existing grades.

The in-situ infiltration testing consisted of auguring a soil probe down to the test depth and installing a solid length of five inch diameter PVC pipe. The pipe was then pre-soaked for 24 hours by filling the pipe with approximately two feet of water. After the initial filling of the pipe, infiltration testing was completed by monitoring the drop in the water level at 60-minute intervals for four hours. The rate of drop over the four total hours is considered the infiltration rate.

3.2 REGIONAL/SITE GEOLOGY

According to the Physiographic Map of Maryland (2008)¹, the site is located within the Mt. Airy Upland District of the Piedmont Plateau Province. The Piedmont Plateau Physiographic Province is an area underlain by ancient igneous and metamorphic rock. The virgin soils encountered in this area are the residual product of in-place chemical weathering of rock which was similar to the rock presently underlying the site. The typical residual soil profile consists of silty to clayey soils near the surface where soil weathering is more advanced, underlain by more sandy silts and silty sands that generally become harder and denser with depth to the top of parent bedrock. The boundary between soil and rock, termed weathered or decomposed rock, is not sharply defined. This transitional zone can contain boulders of more resistant rock as well as highly weathered materials. Materials labeled as “Decomposed Rock” on the boring logs exhibits the remnant structure of the underlying parent bedrock.

The Mt. Airy Upland District is described as rolling upland; herringbone texture due to interaction of thin siltstones and quartzites with stream reaches controlled by joints oblique to the bedrock strike; streams often incised.

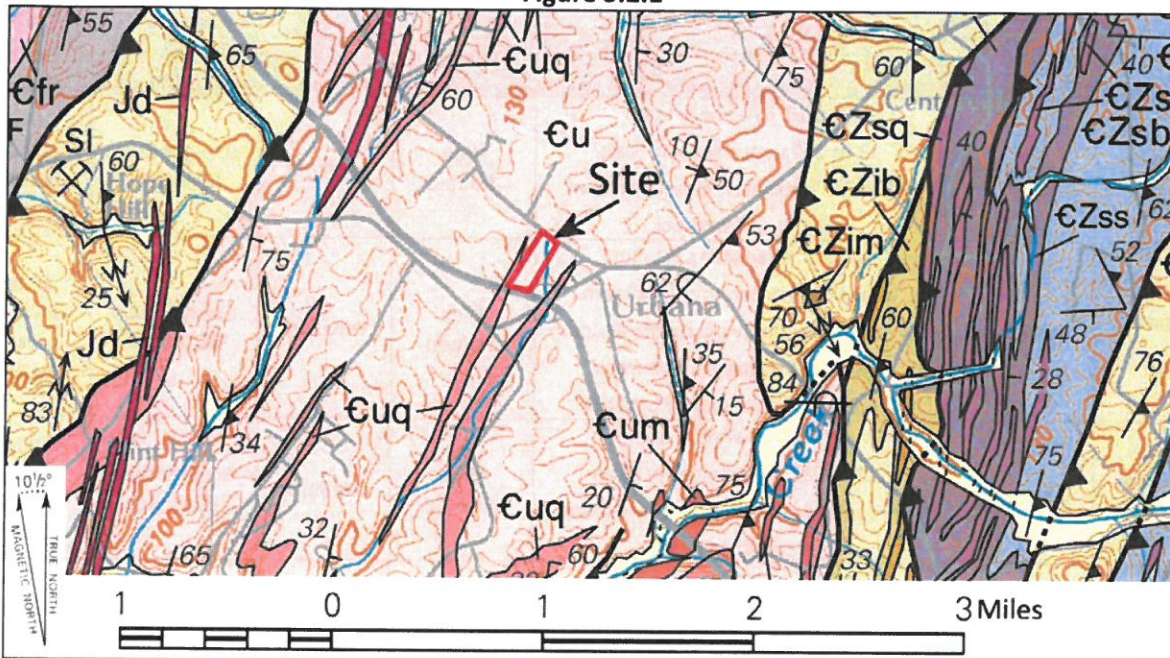
Based upon the Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia (2007)², the site is underlain by the Urbana Formation and Quartzite, both of the Sugarloaf Mountain Anticlinorium and Bush Creek Belt. The Urbana Formation is described as medium-olive-brown to light-olive-gray, poorly sorted, calcareous metasandstone, metagraywacke, quartzite, and metasiltstone. Contains graded beds, crossbeds, and sparse ripple marks. The Quartzite is described as light-olive-gray and light-brownish-gray, thin to medium-bedded, crossbedded, pitted, vuggy, friable, lensoidal and discontinuous, very calcareous metasandstone and quartzite. Interbedded with light-brown laminated metasiltstone.

An overview of the general site geology is illustrated in Figure 3.2.1.

¹ James P. Reger and Emery T. Cleaves. *Physiographic Map of Maryland*. 1:250,000. Maryland Geological Survey, 2008.

² Scott Southworth, David K. Brezinski, Avery Ala Drake, Jr., William C. Burton, Randall C. Orndoff, Albert J. Frolich, James E. Reddy, Danielle Denenny, and David Daniels. *Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia*. 1:100,000. U.S. Geological Survey and Maryland Geologic Survey, 2007.

Figure 3.2.1



Geologic map for Figure 3.2.1 obtained from the Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia (2007)

3.3 SOIL SURVEY MAPPING

Based on our review of the Soil Survey [USDA - Natural Resources Conservation Service (websoilsurvey.nrcs.usda.gov)], the site soils are mapped as Liganore-Hyattstown channery silt loams (LyB and LyC), Myersville silt loam (MvA and MvB), and Rohrsersville-Lantz silt loams (RoB). These soil types are described with properties as illustrated in Figure 3.3.1 below.

Figure 3.3.1

Unit Name		Typical Profile	Natural Drainage Class	Runoff Class	Depth to Groundwater Table	Depth to Restrictive Feature
Linganore-Hyattstown channery silt loams 3 to 8% slopes (LyB)	Linganore	0 to 13" channery loam 13 to 25" very channery loam 25 to 36" extremely channery loam 36 to 48" bedrock	Well drained	Medium	Greater than 80 inches	20 to 40 inches to paralithic bedrock
	Hyattstown	0 to 9" channery silt loam 9 to 14" very channery silt loam 14 to 18" extremely channery silt loam 18 to 26" weathered bedrock 26 to 30" unweathered bedrock	Well drained	Very high	Greater than 80 inches	10 to 20 inches to paralithic bedrock
Linganore-Hyattstown channery silt loams 8 to 15% slopes (LyC)	Linganore	0 to 13" channery loam 13 to 25" very channery loam 25 to 36" extremely channery loam 36 to 48" bedrock	Well drained	Medium	Greater than 80 inches	20 to 40 inches to paralithic bedrock
	Hyattstown	0 to 9" channery silt loam 9 to 14" very channery silt loam 14 to 18" extremely channery silt loam 18 to 26" weathered bedrock 26 to 30" unweathered bedrock	Well drained	Very high	Greater than 80 inches	10 to 20 inches to paralithic bedrock
Myersville silt loam 0 to 3% slopes (MvA)		0 to 12" silt loam 12 to 35" loam 35 to 61" clay loam 61 to 71" sandy loam 71 to 81" bedrock	Well drained	Low	Greater than 80 inches	60 to 80 inches to paralithic bedrock
Myersville silt loam 3 to 8% slopes (MvB)		0 to 12" silt loam 12 to 35" loam 35 to 61" clay loam 61 to 71" sandy loam 71 to 81" bedrock	Well drained	Medium	Greater than 80 inches	60 to 80 inches to paralithic bedrock
Rohrersville-Lantz silt loams 0 to 8% slopes (RoB)	Rohrersville	0 to 9" silt loam 9 to 31" silt loam 31 to 55" loam 55 to 62" loam 62 to 80" bedrock	Somewhat poorly drained	Very high	12 to 18 inches	24 to 36" to fragipan, 60 to 80" to paralithic bedrock
	Lantz	0 to 9" silt loam 9 to 14" silt loam 14 to 47" silt clay loam 47 to 72" gravelly loam	Poorly drained	Very high	0 to 6 inches	60 to 80 inches to paralithic bedrock

Soil mapping of the site vicinity is presented in Figure 3.3.2 below.

Figure 3.3.2



SOIL SURVEY FOR FIGURE 3.3.2 OBTAINED FROM USDA – NATURAL RESOURCES CONSERVATION SERVICE;
WEBSOILSURVEY.NRCS.USDA.GOV

3.4 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata encountered during subsurface exploration. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Table 3.4.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Elevation (ft)	Stratum	Description	Ranges of SPT ⁽¹⁾ N-values (bpf)
0-0.67 ft (Surface cover)	EL 446.0-434.7	n/a	3 to 4 inches of topsoil (all borings except B-6 and B-8), 8 inches of asphalt (B-6 and B-8)	N/A
0.25-8.0 ft (FILL)	EL 445.33-431.0	I	Existing, undocumented fill materials (B-2 to B-8, I-2, and I-3).	4-11
0.25-20.0 ft	EL 445.2-416.5	II	Loose to medium dense SILT (ML), SAND (SM) and GRAVEL (GP-GM), and firm to stiff CLAY (CL), Moist	5-33

Notes: (1) Standard Penetration Test

3.5 GROUNDWATER OBSERVATIONS

Water levels were measured in our borings as noted on the soil boring logs in Appendix B. Groundwater depths measured at the time of drilling ranged from 12.7 feet to 14.7 feet below ground surface (EL 421.2 to EL 423.3). Groundwater seepage into our borings was not observed at the remaining boring locations to the depths that the side walls caved (6.6 to 16.1 feet). Cave depths can be an indicator of groundwater presence.

Table 3.5.1 below outlines the depth and elevation groundwater was encountered at the boring locations.

Table 3.5.1 Groundwater Levels

Boring Location	Depth Groundwater Encountered (ft)	Approximate Elevation Groundwater Encountered (ft)
B-1	12.7	423.3
B-2	14.7	422.3
RW-1	13.8	421.2

It should be noted that fluctuations in the location of ground water conditions can occur as a result of seasonal variations in evaporation, precipitation, surface water run-off, the water level within the on-site wetland area, localized perched water tables, and other factors not present at the time of the subsurface exploration. Perched water may be encountered at the interface of fill and natural soils, at the interface of the clayey soil horizons, or at the interface of soils and bedrock.

Based upon our interpretation of the boring data, it appears that the groundwater level is likely located near EL 423, which is well below the planned finished floor level (EL 446). Groundwater is not likely to be an issue for the planned at-grade development; therefore special underslab drainage systems are not required.

4.0 LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program. Classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties.

Laboratory testing included moisture content testing, Atterberg Limits, washed sieve gradation analyses, and moisture-density relationships (Proctor). The results of the laboratory testing are included in Appendix C.

An experienced geotechnical engineer/engineering geologist visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and ASTM D-2488 (Description and Identification of Soils-Visual/Manual Procedures). After classification, the geotechnical engineer/engineering geologist grouped the various soil types into the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

5.0 PRELIMINARY DESIGN RECOMMENDATIONS

5.1 BUILDING DESIGN

The preliminary recommendations presented in this report are based on the limited project information provided to us, the results of the soil borings, and our engineering analysis. Considering the results of our field exploration, and based on our experience with similar projects, it is our opinion that the site can be made suitable for construction of the planned school.

5.1.1 Foundations

Based on the subsurface exploration, the soils anticipated at foundation subgrade levels (approximately EL 443) are expected to consist of existing fill materials (likely placed during the original building construction in 1959), or new compacted fill. No documentation exists regarding placement and compaction of the existing fill materials; therefore they will not be suitable for direct foundation support. It is likely not economical to undercut and replace the existing fills, therefore we recommend considering ground improvement via aggregate piers to improve the available bearing capacity.

For support of the building, aggregate piers with minimum shaft lengths of about 15 feet can be expected to provide a minimum support capacity of approximately 5,000 psf to 7,000 psf for spread footings and limit total settlement to less than one inch. Higher bearing pressures may be possible, and should be evaluated by the specialty contractor.

5.1.2 Floor Slabs

According to the subsurface exploration, the soils anticipated below the floor slabs should consist of existing fill materials or new compacted fill. These soils are likely suitable for the support of a slab-on-grade, however, there may be areas of soft or yielding soils that should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. When encountered at floor slab subgrade levels, any existing fill should be thoroughly evaluated by the Geotechnical Engineer via test pits, observation of utility excavations, and hand auger borings.

The floor slab subgrade should be prepared in accordance with our recommendations outlined in Section 6.0 Site Construction Recommendations, which includes stripping and fill placement.

5.1.3 Below Grade and Retaining Walls

Below grade walls should be designed to withstand lateral earth pressures and surcharge loads. For preliminary purposes, we recommend that below grade walls be designed for a linearly increasing lateral earth pressure of 60 psf per vertical foot of wall. Any retaining walls which are free to rotate at the top and mobilize more of the shear strength of the soil, should utilize an active lateral earth pressure of 40 psf per foot of wall height, when the back grades are horizontal. These pressures assume that granular materials classifying SM or more granular will be used for backfill behind walls and that drainage behind the walls will be provided as previously discussed. These pressures should not be used for sheeting and shoring design.

5.1.4 Seismic Design Considerations

Seismic Site Classification: The International Building Code (IBC) 2012 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The latter method (N-value method) was used in classifying this site.

Utilizing the data obtained from the on-site boring exploration and our previous experience at neighboring sites, a mean SPT “N”-value of less than 50 blows per foot (bpf) is anticipated within 100 feet of the ground surface; therefore, the Seismic Site Class is **D**. If it is determined that significant advantage could be gained with an improved Site Class, additional site testing could be performed to measure actual shear wave velocities using ReMi test methods along with a site specific analysis. ECS can provide additional consultation upon request.

5.2 SITE DESIGN CONSIDERATIONS

5.2.1 Stormwater Management Facilities

Stormwater management features are planned to be constructed around the site. We have assumed that the facilities will likely consist of a combination micro bio-retention, bio-swales, and infiltration trenches.

Infiltration Characteristics: Five (5) in-situ infiltration tests were completed at the site on May 30, 2018. The infiltration test results are shown in Table 5.2.2.1 below and in Appendix B.

Table 5.2.1.1 Infiltration Test Results

Test Location	Test Depth (ft)	Approximate Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
I-1	4.84	435.5	Medium Dense GRAVELLY SILT (ML)	0.48
I-2	9.27	432.0	Medium Dense SILT with SAND (ML)	0.57
I-3	4.84	437.5	Medium Dense SANDY SILT (ML)	0.72
I-4	4.92	438.0	Firm LEAN CLAY (CL)	0.06
I-5	9.75	431.5	Medium Dense SILT (ML)	0.39

The results reported above are based on field measurements. We recommend that the design rate be calculated as 2/3 of the field rate to account for siltation over time.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 SUBGRADE PREPARATION

Proper monitoring of newly placed fill with respect to lift thickness and compaction of each lift is expected to be necessary at this site. The following paragraphs detail our recommendations regarding earthwork operations.

6.1.1 Demolition

Demolition of the existing structures, pavements, and other existing site features will need to be performed prior to the start of new construction. During site demolition, existing utilities and/or other subsurface structures related to the existing site usage are expected to have been removed and the resulting voids backfilled, per project recommendations using well-compacted engineered fill. Abandoned pipes should not remain beneath the building pad.

The 1965 addition is reportedly supported on caissons. The caissons will be required to be cut down to a depth at least 2 feet below the planned new footing subgrades. The resulting void can be backfilled with new compacted fill or CR-6 aggregate.

6.1.2 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, pavements, utilities, and any other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits and to 5 feet beyond the toe of structural fills. ECS should be called on to verify that pavements, demolition debris, topsoil, utilities, and unsuitable surficial materials have been completely removed prior to the placement of Structural Fill or construction of structures.

6.1.3 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be examined by the Geotechnical Engineer or authorized representative. The exposed subgrade should be thoroughly proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the Geotechnical Engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or “pumping” subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning or chemical stabilization, should be discussed with the Geotechnical Engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. A test pit(s) may be excavated to explore the shallow subsurface materials in the area of the instability to help in determining the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

6.2 EARTHWORK OPERATIONS

6.2.1 Existing Man-Placed Fill

Fill Content: Fill materials up to about 8.5 feet deep were encountered in multiple borings. Fill materials may also be expected in areas of the site that were not explored, particularly in the vicinity of the existing building which is to be demolished. Based on a review of the fill materials, it appears that these fill materials were obtained from the general area, likely during the initial development of the site.

Fill Removal in Non-Building Areas: If encountered, all fill should be thoroughly evaluated by the Geotechnical Engineer via proofrolling. Any fill deemed unstable via the results of a proofroll should be removed from below the expanded fill removal limits of pavements and Structural Fill embankments. The expanded fill removal limits of pavements and Structural Fill embankments should be defined as that area directly below pavements and Structural Fill embankments, and extending horizontally beyond the edge of these a distance of 1 horizontal foot for every vertical foot of Structural Fill depth above natural subgrade, but not less than 5 feet. ECS personnel should ascertain that fill removal has been suitably accomplished.

Fill Removal in Building Areas: Fill materials are expected within and surrounding the footprint of the existing building and paved areas of the site. Any undocumented or unsuitable fill encountered within foundation excavations should be removed per the recommendations provided in Section 5.1.1. Existing fills within planned slab on grade areas should be thoroughly evaluated during construction by the Geotechnical Engineer via proofrolling.

6.2.2 Structural Fill Materials

Product Submittals: Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter, debris, and should contain no particle sizes greater than 4 inches in the largest dimension. Open graded materials, such as Gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable Structural Fill material should have the index properties shown in Table 6.2.2.1.

Table 6.2.2.1 Structural Fill Index Properties

Location with Respect to Final Grade	LL	PI
Building Areas, upper 4 feet	40 max	15 max
Building Areas, below upper 4 feet	50 max	20 max
Pavement Areas, upper 2 feet	40 max	15 max
Pavement Areas, below upper 2 feet	50 max	20 max

Unsatisfactory Materials: Unsatisfactory fill materials include materials which do not satisfy the requirements for suitable materials, as well as topsoil and organic materials (OH, OL), elastic Silt (MH), and high plasticity Clay (CH). The owner can consider allowing soils with a maximum Liquid Limit of 60 and Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas.

On-Site Borrow Suitability: Based on the results of the soil borings and our experience with similar soils from the surrounding areas, a majority of the on-site SILT (ML), SAND (SM), and GRAVEL (GP-GM) soils will be suitable for reuse provided they are conditioned as discussed here. Some of the CLAY (CL) soils encountered had elevated plasticity and may not be immediately suitable for reuse. Further laboratory testing should be completed as part of the final study to more accurately determine the extent of on-site soils which can be made suitable for reuse.

Based on the results of the soil borings and laboratory testing performed, a majority of the on-site soils will be suitable for reuse provided they are conditioned as discussed here. Optimum moisture content obtained from the Proctor testing performed on a sample from boring RW-2 was 17.7%. Typically, in-situ moisture contents of the soil types encountered ranges from 18 to 25%. Therefore, moisture conditioning of subgrades and on-site fill material may be necessary, particularly in the wetter months.

6.2.3 Compaction

Structural Fill Compaction: Structural Fill within the expanded building, pavement, and embankment limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -1 and +3 % of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

6.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick “mud mat” of “lean” concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete to confirm the bearing soils are what were anticipated. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed.

Slab Subgrade Verification: A representative of ECS should be called on to observe exposed subgrades within the expanded building limits prior to Structural Fill Placement to assure that adequate subgrade preparation has been achieved. A proofrolling using a drum roller or loaded dump truck should be performed in their presence at that time. Once subgrades have been prepared to the satisfaction of ECS, subgrades should be properly compacted and new Structural Fill can be placed. If there will be a significant time lag between the site grading work and final grading of concrete slab areas prior to the placement of the subbase stone and concrete, a representative of ECS should be called on to verify the condition of the prepared subgrade.

6.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrade should be observed and probed for stability by ECS to evaluate the suitability of the materials encountered. Any loose or unsuitable materials encountered at the utility pipe subgrade elevation should be removed and replaced with suitable compacted Structural Fill or pipe bedding material.

Utility Backfilling: The granular bedding material should be at least 4 inches thick, but not less than that specified by the project drawings and specifications. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill given in this report. Compacted backfill should be free of topsoil, roots, ice, or any other material designated by ECS as unsuitable. The backfill should be moisture conditioned, placed, and compacted in accordance with the recommendations of this report.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.5 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

Erosion Control: The surface soils are considered to be highly erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

7.0 CLOSING

ECS has prepared this preliminary report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS by Grimm and Parker. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

As this report is preliminary in nature, we recommend that additional subsurface exploration be performed once the existing school is removed, as well as a final geotechnical analysis once final site grades and building loads are determined.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram
Boring Location Diagram
Geologic Map
Soil Survey Map

Worthington Blvd



355

Katherine Aly
Urbana Pike

Sprigg St S
Sprigg Aly

Bremen St

McPherson St

Mantz Ln

Hinks Ln

Brien Pl

Urbana Pike

Urbana Church Rd

270

80

Fingerboard Rd

20

25

Fingerboard Rd

Bennett Creek Ave

Notes: THE SITE IS OUTLINED IN RED

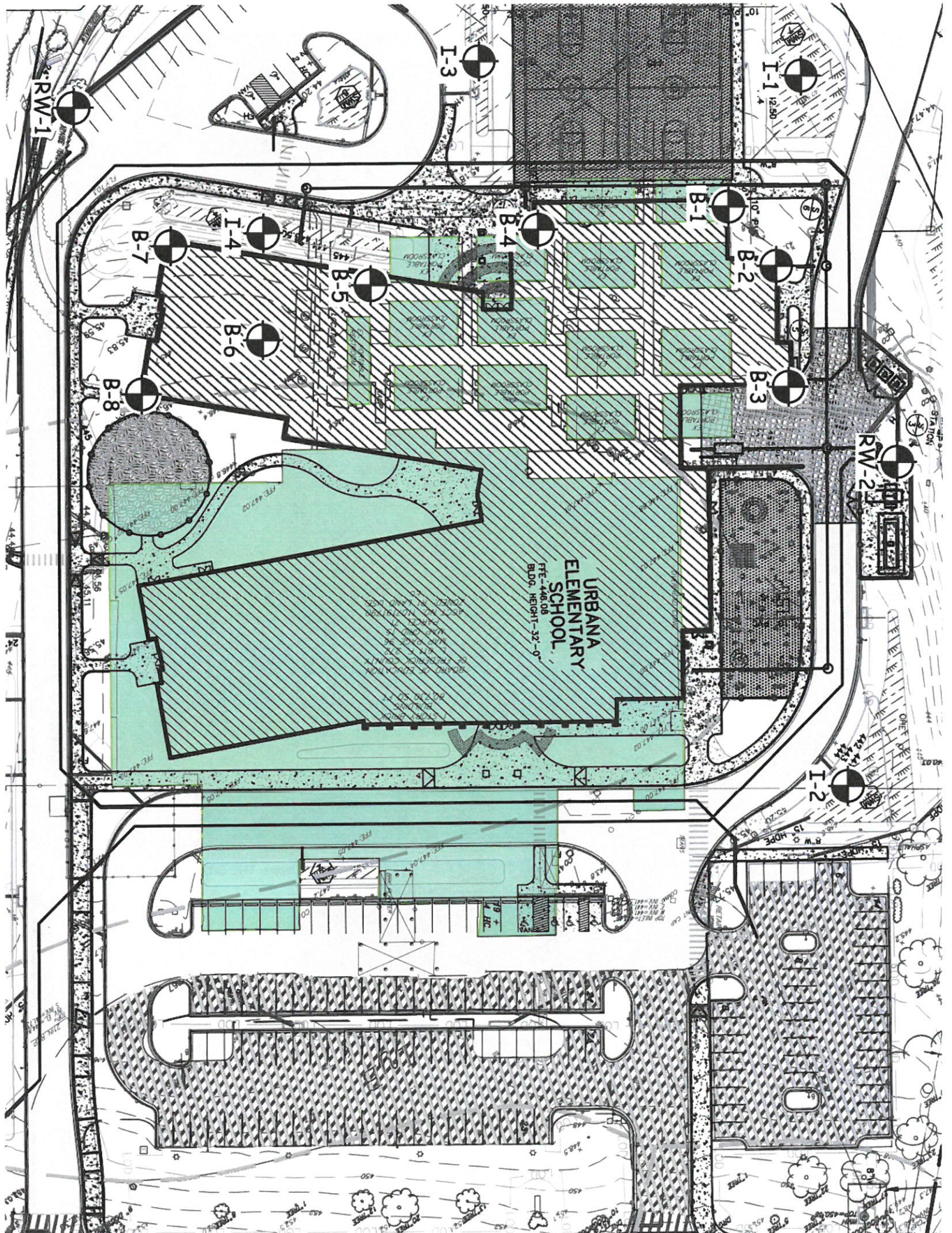


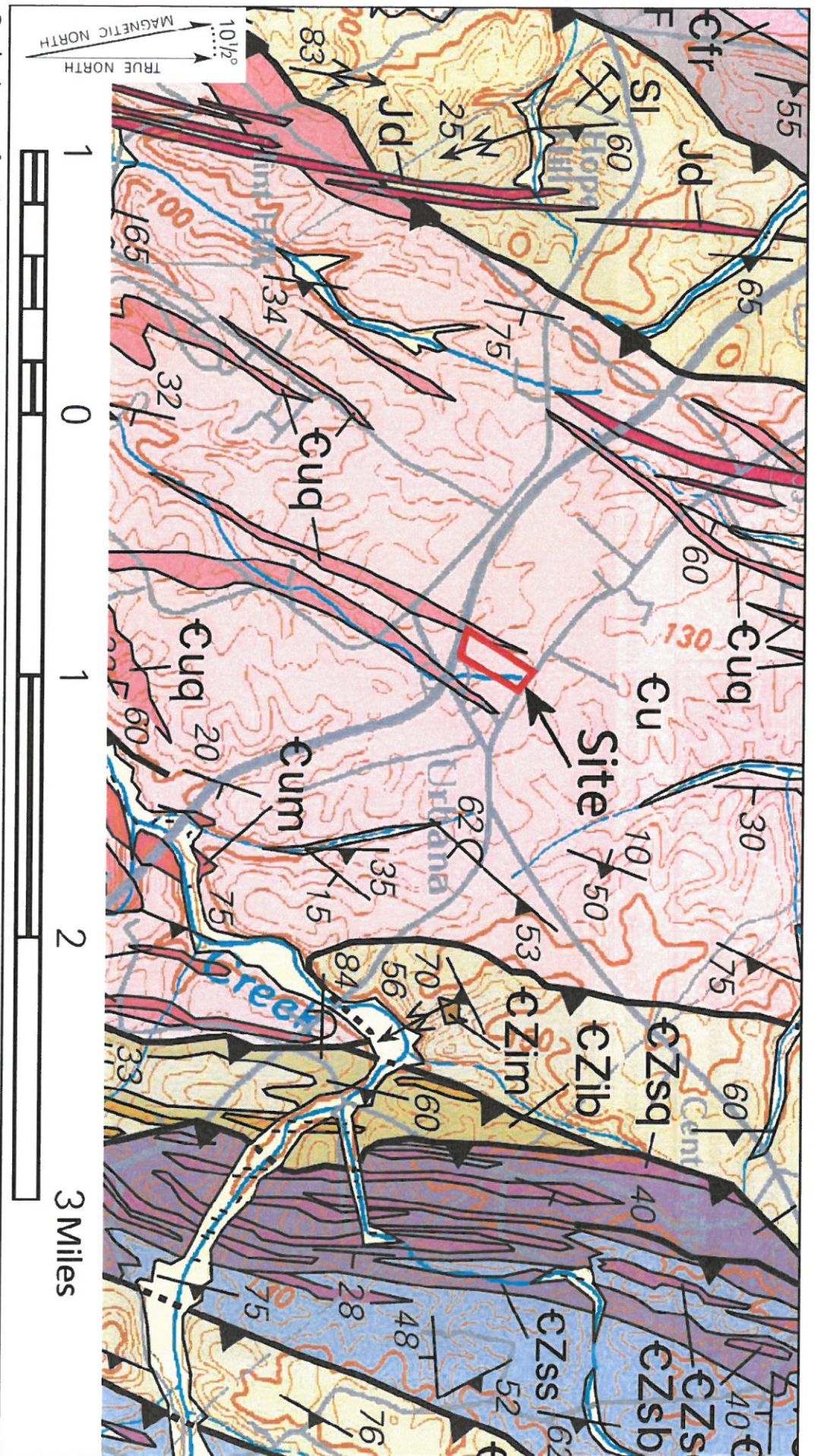
SITE LOCATION DIAGRAM

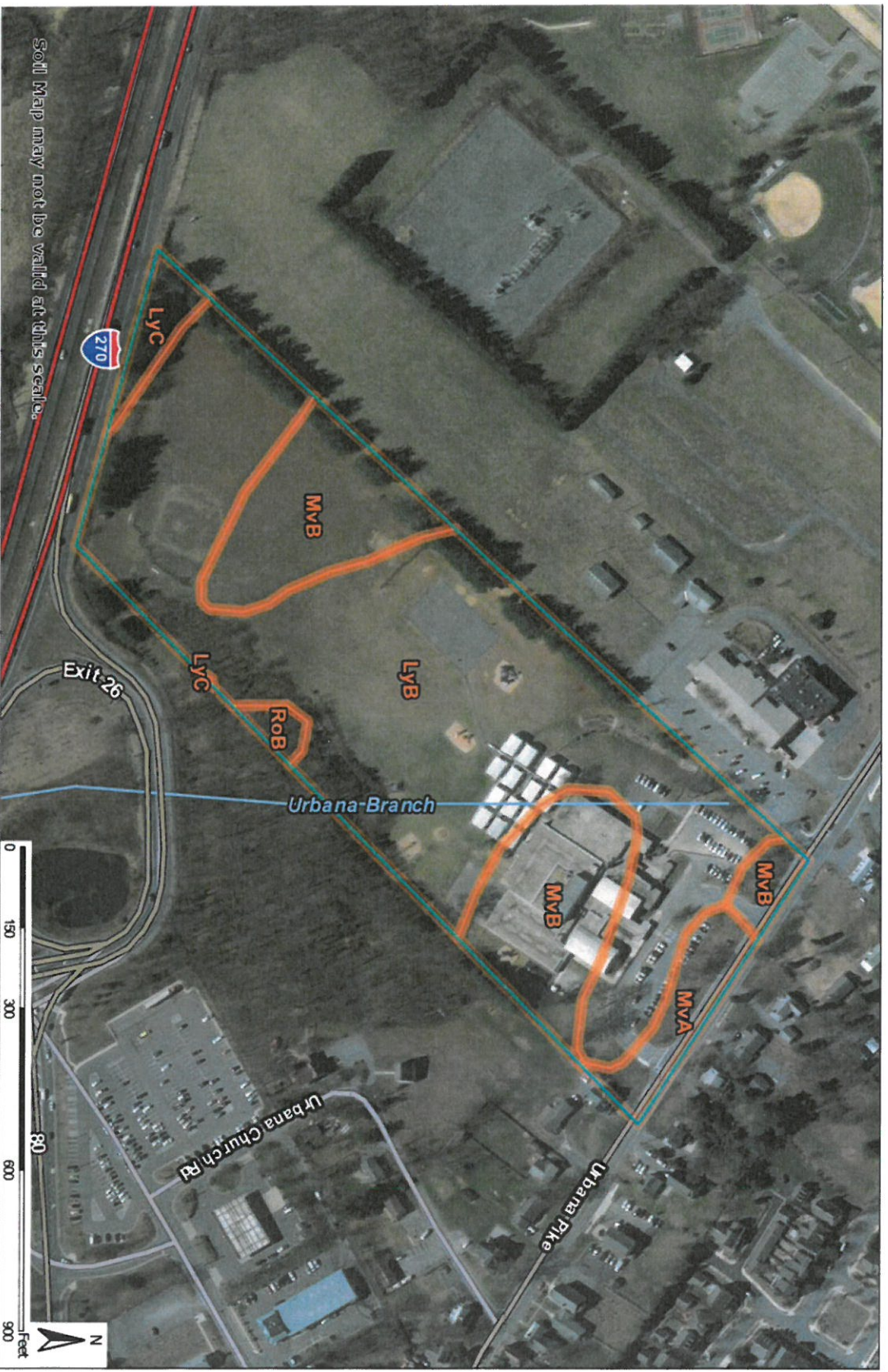
URBANA ELEMENTARY SCHOOL REPLACEMENT - PHASE I

FREDERICK MD 21704
GRIMM & PARKER

ENGINEER	
SCALE	NTS
PROJECT NO.	13:8624
SHEET	1 OF 1
DATE	5/2/2018







Soil Survey image obtained from USDA – Natural Resources Conservation Service; websoilsurvey.nrcs.usda.gov

APPENDIX B – Field Operations

Reference Notes for Boring Logs

Boring Logs (B-1 through B-8, I-1 through I-5, RW-1, and RW-2)

Infiltration Test Results



REFERENCE NOTES FOR BORING LOGS

MATERIAL ^{1,2}	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL ³ MAN-PLACED SOILS
	GW WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM SILTY GRAVEL gravel-sand-silt mixtures
	GC CLAYEY GRAVEL gravel-sand-clay mixtures
	SW WELL-GRADED SAND gravelly sand, little or no fines
	SP POORLY-GRADED SAND gravelly sand, little or no fines
	SM SILTY SAND sand-silt mixtures
	SC CLAYEY SAND sand-clay mixtures
	ML SILT non-plastic to medium plasticity
	MH ELASTIC SILT high plasticity
	CL LEAN CLAY low to medium plasticity
	CH FAT CLAY high plasticity
	OL ORGANIC SILT or CLAY non-plastic to low plasticity
	OH ORGANIC SILT or CLAY high plasticity
	PT PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION	
DESIGNATION	PARTICLE SIZES
Boulders	12 inches (300 mm) or larger
Cobbles	3 inches to 12 inches (75 mm to 300 mm)
Gravel: Coarse	¾ inch to 3 inches (19 mm to 75 mm)
Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand: Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")	<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_p ⁴	SPT ⁵ (BPF)	CONSISTENCY ⁷ (COHESIVE)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Medium Stiff
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT ⁷	COARSE GRAINED (%) ⁸	FINE GRAINED (%) ⁸
Trace	≤5	≤5
Dual Symbol (ex: SW-SM)	10	10
With	15 - 20	15 - 25
Adjective (ex: "Silty")	≥25	≥30

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT ⁵	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS ⁶		
	WL	Water Level (WS)(WD) (WS) While Sampling (WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

¹ Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.

² To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

³ Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

⁴ Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

⁵ Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).

⁶ The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

⁷ Minor deviation from ASTM D 2488-09 Note 16.

⁸ Percentages are estimated to the nearest 5% per ASTM D 2488-09.

CLIENT Grimm & Parker			Job #: 13:8624	BORING # B-1	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I			ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD						

NORTHING		EASTING		STATION	
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DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"
					BOTTOM OF CASING LOSS OF CIRCULATION			
					SURFACE ELEVATION 436			
0					Topsoil Depth [3.00"]		435	2
1	S-1	SS	18	18	(ML) SILT, trace sand, orange, moist, loose to medium dense			3
2								4
3	S-2	SS	18	18				5
4								6
5								7
6	S-3	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense		430	8
7								9
8								10
9	S-4	SS	18	16	(ML) SANDY SILT WITH GRAVEL, tan, moist, medium dense			11
10								12
11								13
12								14
13								15
14								16
15	S-5	SS	18	15	(GP-GM) GRAVEL WITH SILT And SAND, brown, moist, dense		425	17
16								18
17								19
18								20
19								21
20	S-6	SS	11	8	(WR) WEATHERED ROCK SAMPLED AS GRAVEL WITH SAND, brown, moist, very dense [Weathered ROCK]		420	22
21					END OF BORING @ 19.42'			23
22								24
23								25
24								26
25								27
26								28
27								29
28								30
29								31
30								32

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 14.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 14.0'
WL(SHW) WL(ACR) 12.7	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-2	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING		EASTING		STATION		-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● ▲ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	
					BOTTOM OF CASING ➡	LOSS OF CIRCULATION ➡	
					SURFACE ELEVATION 437		
0					Topsoil Depth [3.00"]		
1	S-1	SS	18	18	(ML FILL) SILT, trace sand, trace clay, contains slight roots, light brown, moist, loose		2
2							3
3							4
4	S-2	SS	18	18			5
5							6
6							7
7	S-3	SS	18	18	(ML) GRAVELLY SILT WITH SAND, orange and black, moist, medium dense		8
8							9
9							10
10	S-4	SS	18	18	(GP-GM) GRAVEL WITH SILT And SAND, orange and black, moist, medium dense		11
11							12
12							13
13							14
14	S-5	SS	18	18	(ML) SILT WITH SAND, black, moist, medium dense, contains organics		15
15							16
16							17
17							18
18	S-6	SS	18	18	(ML) SILT, trace sand, tan, moist, medium dense		19
19							20
20					END OF BORING @ 20.00'		21
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99							100

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 15.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 14.8'
WL(SHW) WL(ACR) 14.7	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker			Job #: 13:8624	BORING # B-3	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I			ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD						

NORTHING		EASTING		STATION	
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DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6'
					BOTTOM OF CASING LOSS OF CIRCULATION			
					SURFACE ELEVATION 442			
0					Topsoil Depth [3.00"] (ML FILL) FILL, SILT WITH SAND, trace gravel, orangish brown, moist, loose		440	6
5	S-1	SS	18	18				5
	S-2	SS	18	16				6
	S-3	SS	18	0	(GP FILL) FILL, GRAVEL, gray, moist, loose		435	10
10	S-4	SS	18	18	(ML) SILT, trace sand, trace gravel, trace clay, orangish brown, moist, loose		430	26
15	S-5	SS	18	18	(ML) SILT, trace sand, tan to brown, moist, medium dense		425	30
20	S-6	SS	18	18			420	
					END OF BORING @ 20.00'		415	
25								
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

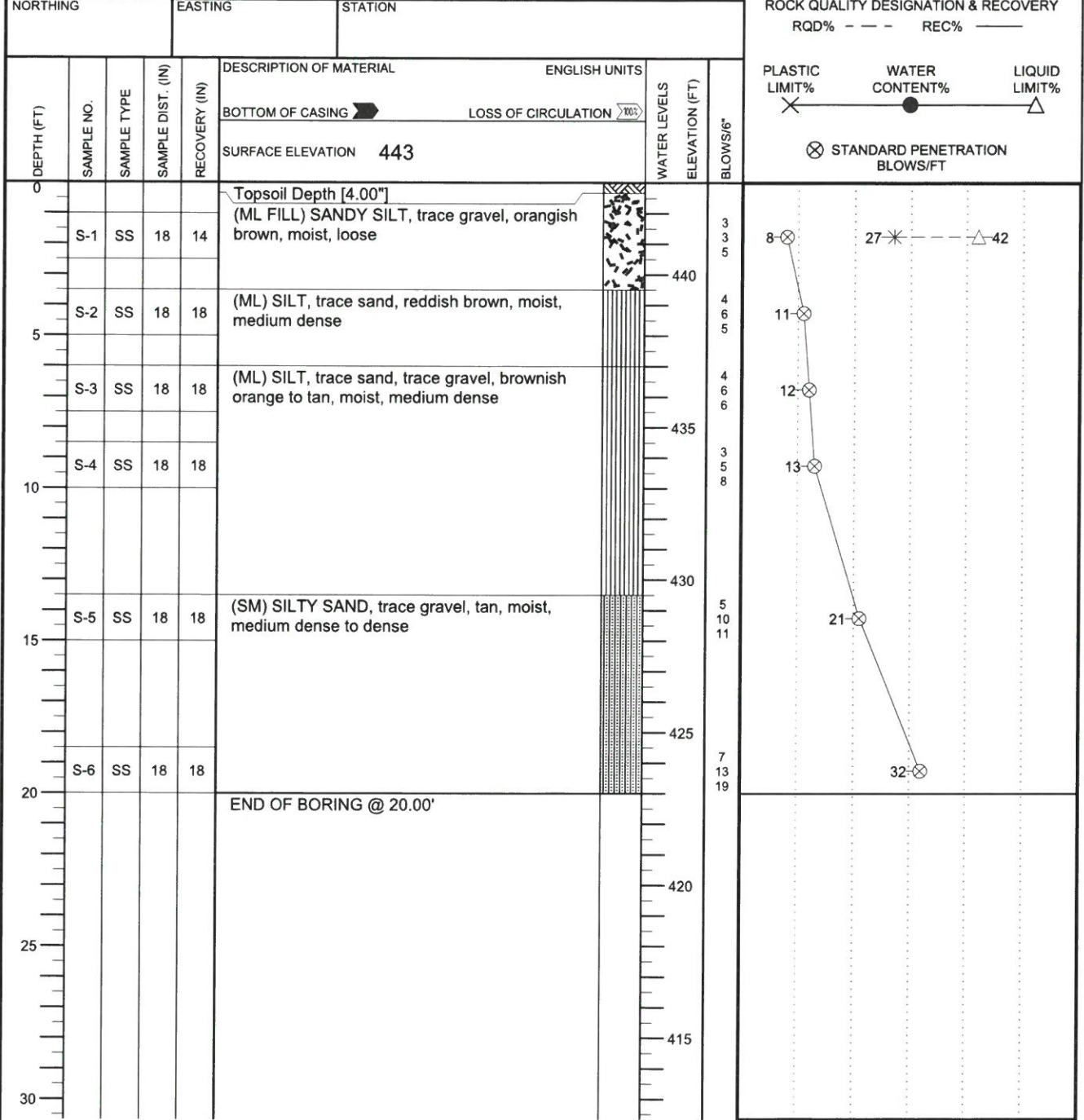
<input checked="" type="checkbox"/> WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 12.9'
<input checked="" type="checkbox"/> WL(SHW) <input checked="" type="checkbox"/> WL(ACR) Dry	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
<input checked="" type="checkbox"/> WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

-○- CALIBRATED PENETROMETER TONS/FT²
 ROCK QUALITY DESIGNATION & RECOVERY
 RQD% - - - REC% - - -
 PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%
 X ● △
 ⊗ STANDARD PENETRATION BLOWS/FT

CLIENT Grimm & Parker			Job #: 13:8624	BORING # B-4	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I			ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD						
NORTHING		EASTING		STATION		○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS BOTTOM OF CASING ➡ LOSS OF CIRCULATION ➡ SURFACE ELEVATION 440	WATER LEVELS ELEVATION (FT) BLOWS/6"
0					Topsoil Depth [4.00"] (ML FILL) SILT WITH SAND, trace gravel, brownish orange, moist, loose	440
2	S-1	SS	18	8		9
4						11
5	S-2	SS	18	18		4
6						5
8	S-3	SS	18	18	(CL) LEAN CLAY, orange to tan, moist, stiff to firm	10
10						8
12	S-4	SS	18	18		31
14						50/6
16	S-5	SS	18	16	(SM) SILTY SAND WITH GRAVEL, tan, moist, dense	
18						
20	S-6	SS	6	6	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND WITH GRAVEL, tan, moist, very dense [Weathered ROCK] END OF BORING @ 19.00'	
22						
24						
26						
28						
30						
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.						
WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 05/29/18		CAVE IN DEPTH @ 15.8'		
WL(SHW) WL(ACR) Dry		BORING COMPLETED 05/29/18		HAMMER TYPE Auto		
WL		RIG CME 550 FOREMAN Dale Price		DRILLING METHOD HSA		

CLIENT Grimm & Parker	Job #: 13:8624	BORING # B-5	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I		ARCHITECT-ENGINEER		

SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD			○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT
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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL	WS	WD	BORING STARTED	05/23/18	CAVE IN DEPTH @ 15.8'
WL(SHW)	WL(ACR)	Dry	BORING COMPLETED	05/23/18	HAMMER TYPE Auto
WL			RIG CME 550	FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-6	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING				EASTING		STATION	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)
					BOTTOM OF CASING LOSS OF CIRCULATION		
					SURFACE ELEVATION 445		
0					Asphalt Depth [8.00"]		445
	S-1	SS	18	14	(ML FILL) FILL, GRAVELLY SILT WITH SAND, brown, moist, loose		3
							4
	S-2	SS	18	18	(CL FILL) FILL, GRAVELLY CLAY WITH SAND, brownish red, moist, firm		3
5							4
	S-3	SS	18	18	(ML FILL) FILL, GRAVELLY SILT WITH SAND, brown, moist, loose		3
							4
	S-4	SS	18	18	(ML) SANDY SILT, trace gravel, brownish orange, moist, medium dense		5
10							7
							12
	S-5	SS	18	18	(ML) SILT WITH GRAVEL, trace sand, brownish orange, moist, medium dense		6
15							9
							13
	S-6	SS	18	18	(GP-GM) GRAVEL WITH SILT, tan, moist, medium dense		11
20							14
					END OF BORING @ 20.00'		16
25							420
30							415

CALIBRATED PENETROMETER TONS/FT²
 ROCK QUALITY DESIGNATION & RECOVERY
 RQD% --- REC% ---
 PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%
 STANDARD PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 15.7'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker			Job #: 13:8624		BORING # B-7		SHEET 1 OF 1						
PROJECT NAME Urbana Elementary School Replacement - Phase I			ARCHITECT-ENGINEER										
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD													
NORTHING			EASTING			STATION			○— CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ———				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		ENGLISH UNITS		WATER LEVELS ELEVATION (FT)	BLOWS/6"	PLASTIC LIMIT% <input checked="" type="checkbox"/> WATER CONTENT% <input checked="" type="checkbox"/> LIQUID LIMIT% <input checked="" type="checkbox"/> ⊗ STANDARD PENETRATION BLOWS/FT		
					BOTTOM OF CASING LOSS OF CIRCULATION 100% SURFACE ELEVATION 442								
0					Topsoil Depth [3.00"]								
	S-1	SS	18	14	(ML FILL) FILL, SILT WITH SAND, trace gravel, brown, moist, loose				2 3 3				
	S-2	SS	18	16	(CL FILL) FILL, LEAN CLAY, trace sand, brown, moist, soft				2 2 2				
5					(ML) SANDY SILT, trace gravel, brownish orange to tan and brown, moist, medium dense				2 3 4				
	S-3	SS	18	3								5 8 11	
	S-4	SS	18	18								6 7 10	
10													
	S-5	SS	18	18					9 14 13				
15													
	S-6	SS	18	18									
20					END OF BORING @ 20.00'								
25													
30													

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL <input checked="" type="checkbox"/> WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 16.1'
WL(SHW) <input checked="" type="checkbox"/> WL(ACR) Dry <input checked="" type="checkbox"/>	BORING COMPLETED 05/23/18	HAMMER TYPE Auto
WL <input checked="" type="checkbox"/>	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-8	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING		EASTING		STATION		-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	
					BOTTOM OF CASING ➡	LOSS OF CIRCULATION ➡	
					SURFACE ELEVATION	446	
0					Asphalt Depth [8.00"]		
	S-1	SS	18	14	(CL/ML FILL) FILL, SILTY CLAY WITH SAND, contains slight roots, brownish orange, moist, soft		445
	S-2	SS	18	16	(CL/ML FILL) FILL, SILTY CLAY, contains slight roots and wood, orange to tan, moist, firm		440
5	S-3	SS	18	18	(ML) SILT WITH SAND, tannish orange, moist, medium dense		440
	S-4	SS	18	18	(ML) GRAVELLY SILT WITH SAND, tan, moist, medium dense		435
10							
	S-5	SS	18	18	(GP-GM) GRAVEL WITH SILT And SAND, tan, moist, medium dense		430
15							
	S-6	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense		425
20					END OF BORING @ 20.00'		420
25							
30							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL <input checked="" type="checkbox"/> WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 15.5'
WL(SHW) <input checked="" type="checkbox"/> WL(ACR) <input checked="" type="checkbox"/> Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Manual
WL <input checked="" type="checkbox"/>	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # I-1	SHEET 1 OF 1			
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER					
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD									
NORTHING				EASTING		STATION		○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% ———	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"	PLASTIC LIMIT% <input checked="" type="checkbox"/> WATER CONTENT% <input checked="" type="checkbox"/> LIQUID LIMIT% <input type="checkbox"/> ⊗ STANDARD PENETRATION BLOWS/FT
					BOTTOM OF CASING LOSS OF CIRCULATION				
					SURFACE ELEVATION 440.5				
0					Topsoil Depth [4.00"]		440		
	S-1	SS	18	14	(ML) SILT, trace gravel, trace sand, brownish red, moist, loose				
	S-2	SS	18	16	(ML) GRAVELLY SILT, brownish red, moist, medium dense				
5	S-3	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense				
	S-4	SS	18	18	(ML) SILT WITH SAND, dark brown, moist, medium dense				
10					END OF BORING @ 10.00'		430		
15							425		
20							420		
25							415		
30							410		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

<input checked="" type="checkbox"/> WL <input type="checkbox"/> WS <input checked="" type="checkbox"/> WD	BORING STARTED 05/23/18	CAVE IN DEPTH @ 7.2'
<input checked="" type="checkbox"/> WL(SHW) <input checked="" type="checkbox"/> WL(ACR) Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Manual
<input checked="" type="checkbox"/> WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

[illegible]











CLIENT Grimm & Parker						Job #: 13:8624		BORING # I-3		SHEET 1 OF 1			
PROJECT NAME Urbana Elementary School Replacement - Phase I						ARCHITECT-ENGINEER							
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD													
NORTHING				EASTING				STATION					
DEPTH (FT)		SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		ENGLISH UNITS		WATER LEVELS ELEVATION (FT)		BLOWS/6"	
						BOTTOM OF CASING ➡		LOSS OF CIRCULATION ➤100					
						SURFACE ELEVATION 442.5							
0						Topsoil Depth [4.00"]				2		8-⊗	
4		S-1	SS	18	16	(ML FILL) GRAVELLY SILT WITH SAND, reddish brown, moist, loose				4		16-⊗	
5		S-2	SS	18	18	(ML) SANDY SILT, brown, moist, medium dense				6		15-⊗	
7										7			
8		S-3	SS	18	18	(ML) GRAVELLY SILT WITH SAND, brownish red, moist, medium dense				5		16	
9										8			
10		S-4	SS	18	18	(SM) SILTY SAND WITH GRAVEL, brown, moist, medium dense				4			
7										7			
9						END OF BORING @ 10.00'				9			
15													
20													
25													
30													
<div style="float:right;"> ⊗ CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △ ⊗ STANDARD PENETRATION BLOWS/FT </div>													
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.													
WL		WS □ WD ☒		BORING STARTED 05/23/18		CAVE IN DEPTH @ 6.9'							
WL(SHW)		WL(ACR) Dry		BORING COMPLETED 05/23/18		HAMMER TYPE Auto							
WL				RIG CME 550		FOREMAN Dale Price		DRILLING METHOD HSA					

CLIENT Grimm & Parker			Job #: 13:8624		BORING # I-4		SHEET 1 OF 1											
PROJECT NAME Urbana Elementary School Replacement - Phase I			ARCHITECT-ENGINEER															
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD																		
NORTHING			EASTING			STATION			○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% ———									
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		ENGLISH UNITS		WATER LEVELS ELEVATION (FT)	BLOWS/6"	PLASTIC LIMIT% ✕	WATER CONTENT% ●	LIQUID LIMIT% △					
					BOTTOM OF CASING ➡ LOSS OF CIRCULATION ➤						SURFACE ELEVATION 443			✕ STANDARD PENETRATION BLOWS/FT				
0					Topsoil Depth [3.00"] (CL) LEAN CLAY, trace sand, trace gravel, brownish red, moist, firm				440	1	5							
	S-1	SS	18	16									2	5				
	S-2	SS	18	12												3	10	
5																		
	S-3	SS	18	18	5													
								6										
	S-4	SS	18	18							7							
10														10				
	END OF BORING @ 10.00'				435													
								430										
											425							
15														420				
	415																	
20																		
25																		
30																		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL <input checked="" type="checkbox"/> WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 6.6'
WL(SHW) <input checked="" type="checkbox"/> WL(ACR) <input checked="" type="checkbox"/> Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Auto
WL <input checked="" type="checkbox"/>	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # I-5	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING				EASTING		STATION	
<div style="display: flex; justify-content: space-between;"> <div> DEPTH (FT) 0 5 10 15 20 25 30 </div> <div> SAMPLE NO. S-1 S-2 S-3 S-4 S-5 </div> <div> SAMPLE TYPE SS SS SS SS SS </div> <div> SAMPLE DIST. (IN) 18 18 18 18 18 </div> <div> RECOVERY (IN) 16 18 18 18 18 </div> </div>				DESCRIPTION OF MATERIAL BOTTOM OF CASING LOSS OF CIRCULATION		ENGLISH UNITS SURFACE ELEVATION 441.5	WATER LEVELS ELEVATION (FT) BLOWS/6"
				(ML) SILT, trace sand, orange to brownish orange, moist, loose to medium dense (ML) SILT, trace sand, trace gravel, tan, moist, medium dense END OF BORING @ 15.00'		440 435 430 425 420 415	2 2 4 4 5 6 4 6 6 4 6 8 5 7 11
<div style="display: flex; justify-content: space-between;"> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> <div> STANDARD PENETRATION BLOWS/FT </div> </div>							
<div style="display: flex; justify-content: space-between;"> <div> 6 11 12 14 18 </div> <div> </div> </div>							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 05/23/18		CAVE IN DEPTH @ 12.6'	
WL(SHW)		WL(ACR) Dry		BORING COMPLETED 05/23/18		HAMMER TYPE Auto	
WL				RIG CME 550 FOREMAN Dale Price		DRILLING METHOD HSA	

CLIENT Grimm & Parker		Job #: 13:8624		BORING # RW-1		SHEET 1 OF 1			
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER					
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD									
NORTHING			EASTING			STATION			
<div style="display: flex; justify-content: space-between;"> <div> <p>DEPTH (FT)</p> <p>0</p> <p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> </div> <div> <p>SAMPLE NO.</p> <p>SAMPLE TYPE</p> <p>SAMPLE DIST. (IN)</p> <p>RECOVERY (IN)</p> </div> <div> <p>DESCRIPTION OF MATERIAL</p> <p>ENGLISH UNITS</p> <p>BOTTOM OF CASING  LOSS OF CIRCULATION </p> <p>SURFACE ELEVATION 435</p> </div> <div> <p>WATER LEVELS</p> <p>ELEVATION (FT)</p> <p>BLOWS/6'</p> </div> </div>									
<p>Topsoil Depth [4.00"]</p> <p>(ML) GRAVELLY SILT WITH SAND, brown, moist, loose</p> <p>(SM) SILTY SAND, trace gravel, brownish red, moist, medium dense</p> <p>(ML) SANDY SILT, trace gravel, tan, moist, medium dense</p> <p>(ML) SILT WITH SAND, tan, moist, loose to medium dense</p> <p>END OF BORING @ 20.00'</p>									
<div style="display: flex; justify-content: space-between;"> <div> <p>7-</p> <p>14-</p> <p>16-</p> <p>11-</p> <p>10-</p> <p>16-</p> </div> <div> <p>PLASTIC LIMIT%</p> <p>WATER CONTENT%</p> <p>LIQUID LIMIT%</p> <p> STANDARD PENETRATION BLOWS/FT</p> </div> </div>									
<p>THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.</p>									
WL 15.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 05/29/18		CAVE IN DEPTH @ 14.1'			
WL(SHW)		WL(ACR) 13.8		BORING COMPLETED 05/29/18		HAMMER TYPE Auto			
WL				RIG CME 550 FOREMAN Dale Price		DRILLING METHOD HSA			

CLIENT Grimm & Parker				Job #: 13:8624	BORING # RW-2	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING				EASTING		STATION		○—○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% — — —
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		ENGLISH UNITS	
					BOTTOM OF CASING LOSS OF CIRCULATION		WATER LEVELS	
					SURFACE ELEVATION 445.5		ELEVATION (FT)	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Topsoil Depth [4.00"]</p> <p>(CL) CLAY WITH SAND, trace gravel, orangish brown, moist, firm</p> <p>S-1 BAG 2-5 SS 18 14</p> <p>S-2 SS 18 16</p> <p>S-3 SS 18 18</p> <p>S-4 SS 18 18</p> <p>S-5 SS 18 18</p> <p>S-6 SS 18 18</p> <p>END OF BORING @ 20.00'</p> </div> <div style="width: 45%; text-align: right;"> <p>445</p> <p>440</p> <p>435</p> <p>430</p> <p>425</p> <p>420</p> <p>415</p> </div> </div>								
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>7</p> <p>8</p> <p>11</p> <p>15</p> <p>27</p> <p>32</p> </div> <div style="width: 45%; text-align: right;"> <p>27</p> <p>49</p> </div> </div>								
PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ⊗ STANDARD PENETRATION BLOWS/FT								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 16.1'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

Test Location	Test Depth (ft)	Approximate Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
I-1	4.84	435.5	Medium Dense GRAVELLY SILT (ML)	0.48
I-2	9.27	432.0	Medium Dense SILT with SAND (ML)	0.57
I-3	4.84	437.5	Medium Dense SANDY SILT (ML)	0.72
I-4	4.92	438.0	Firm LEAN CLAY (CL)	0.06
I-5	9.75	431.5	Medium Dense SILT (ML)	0.39

**Appendix B – Field Operations
Infiltration Test Results**
ECS Project No. 13:8624



Urbana Elementary School Replacement
3554 Urbana Pike
Urbana, Frederick County, Maryland

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

Plasticity Chart

Grain Size Analysis

Moisture-Density Relationship Curves

Page 1 of 1

[illegible]

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 13:8624

Project Name: Urbana Elementary School Replacement - Phase I

PM: **Greg Ratkowski**

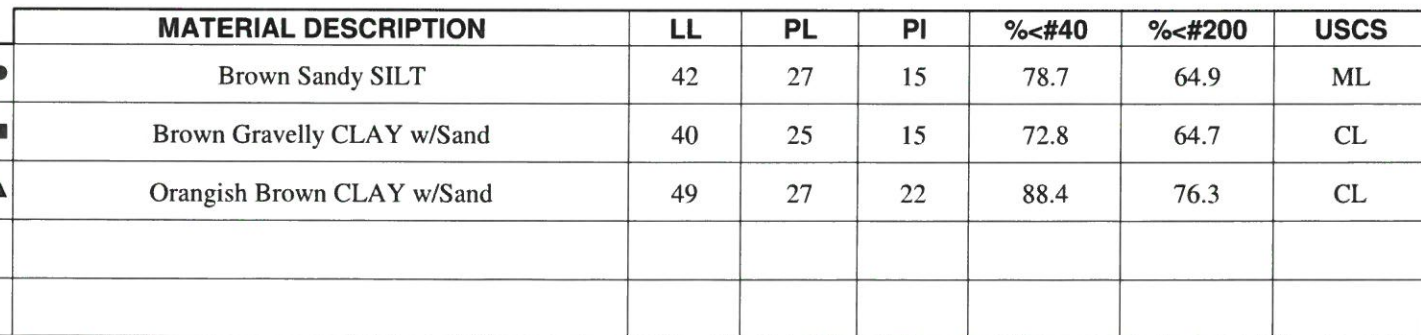
PE: Jeff McGregor

Printed On: Thursday, June 21, 2018



ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

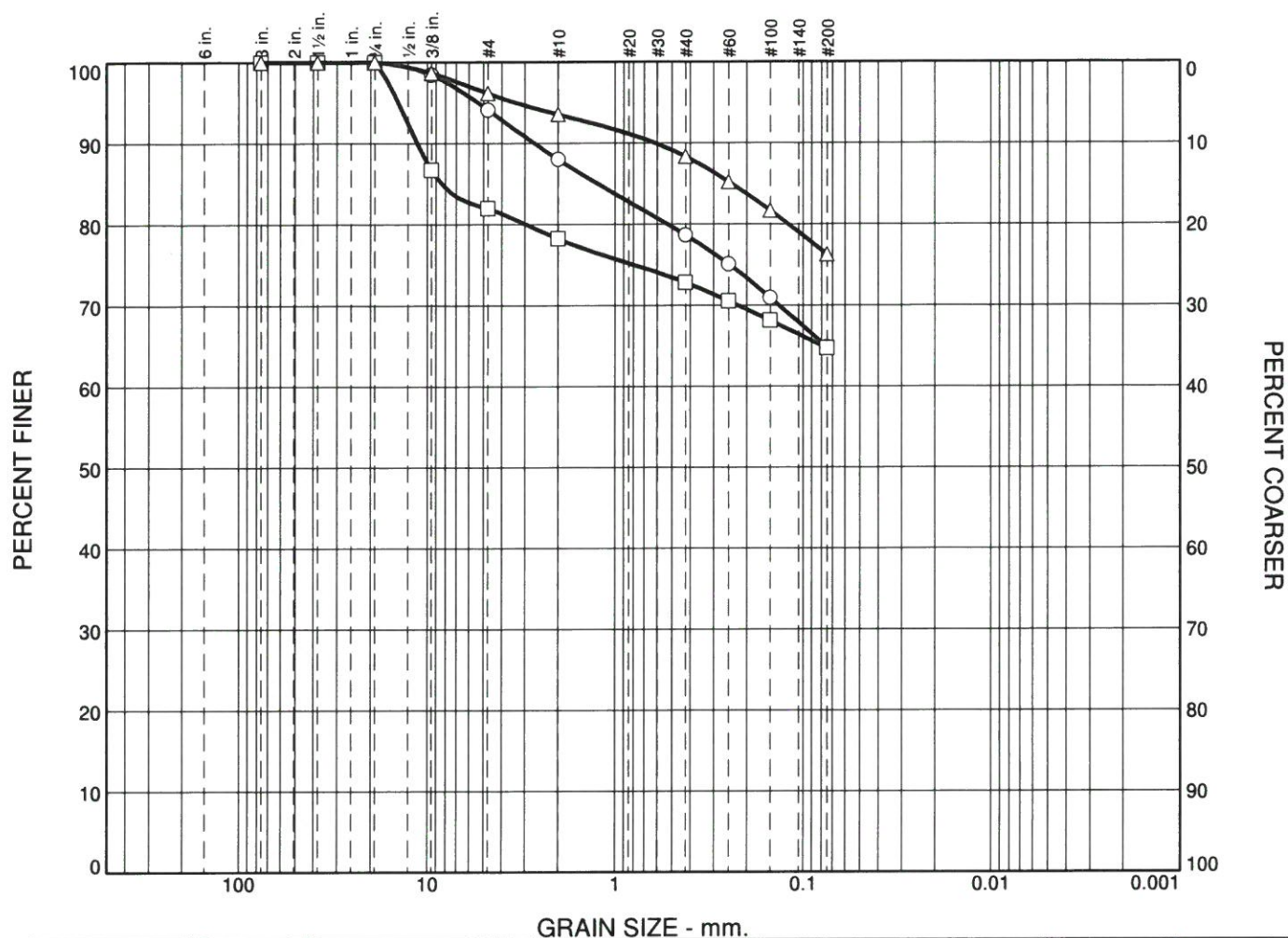
These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.



Checked By: PK

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently iden

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	5.9	6.0	9.4	13.8	64.9	
□	0.0	0.0	18.0	3.7	5.5	8.1	64.7	
△	0.0	0.0	3.8	2.6	5.2	12.1	76.3	

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-5	S-1	1.00-2.50	Brown Sandy SILT	ML
□	B-6	S-2	3.50-5.00	Brown Gravelly CLAY w/Sand	CL
△	RW-2	BAG 2-5	2.00-5.00	Orangish Brown CLAY w/Sand	CL



ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

Client: Grimm & Parker

Project: Urbana Elementary School Replacement - Phase I

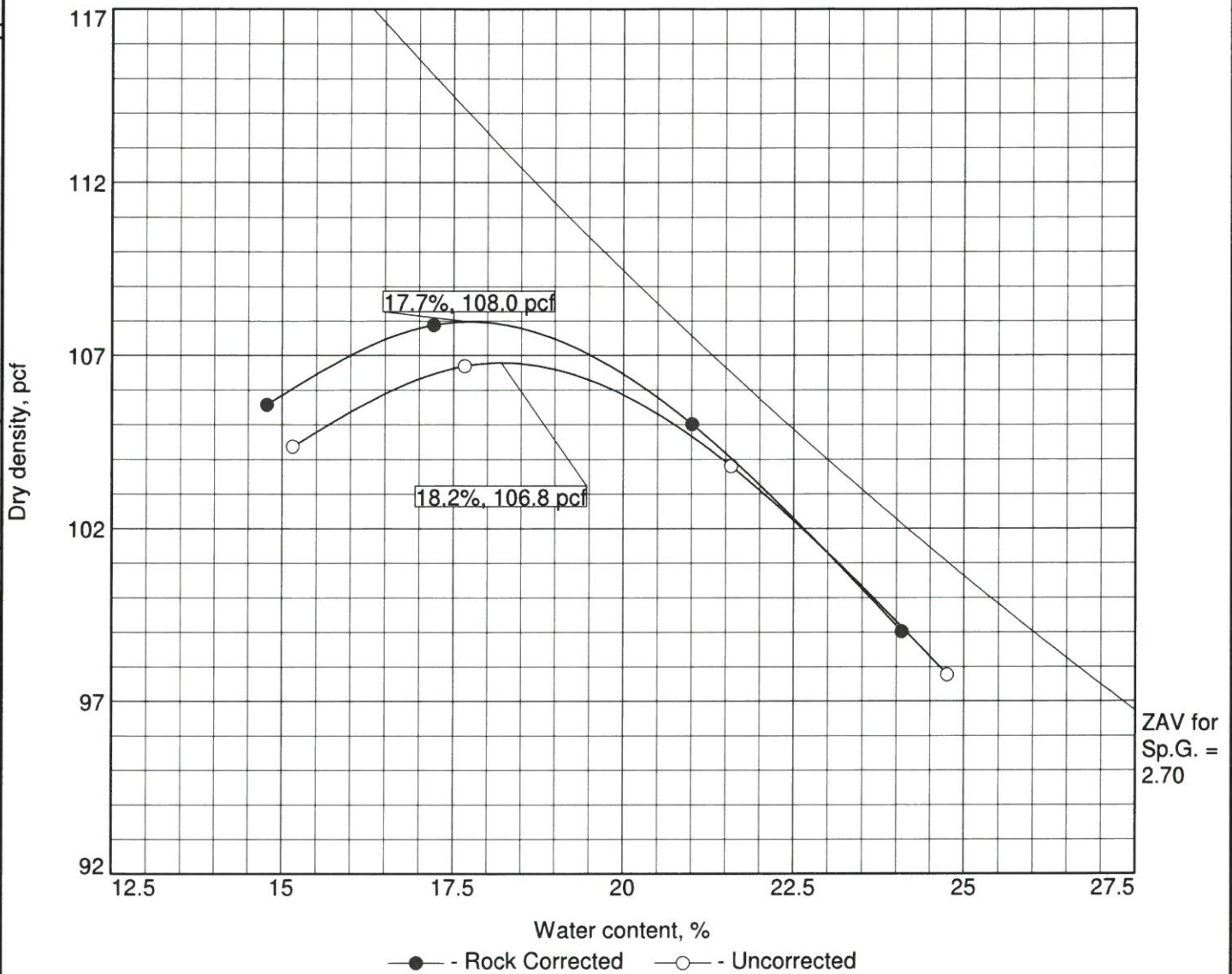
Project No.: 8624

Figure

Tested By: PK

Checked By: PK

COMPACTION TEST REPORT For Curve No. BAG 2-5



Test specification: ASTM D 698-12 Method A Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
2.00-5.00	CL	A-7-6(17)		2.7	49	22	3	76.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 108.0 pcf	106.8 pcf	Orangish Brown CLAY w/Sand
Optimum moisture = 17.7 %	18.2 %	

Project No. 8624 Client: Grimm & Parker
Project: Urbana Elementary School Replacement - Phase I
Date: 06/20/
Source of Sample: RW-2 Sample Number: BAG 2-5

Remarks:



ECS MID-ATLANTIC, LLC

5112 Pegasus Court, Suite S
Frederick, MD 21704

Phone: (301) 668-4303
Fax: (301) 668-3519

Figure

Tested By: PK

Checked By: PK

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.



ECS Mid-Atlantic, LLC

Geotechnical Engineering Report

Urbana Elementary School Replacement - Phase II

3554 Urbana Pike
Frederick, Maryland

ECS Project Number 13:8624-A

December 31, 2018





December 31, 2018

Ms. Kristy Price
Grimm and Parker
11720 Beltsville Drive
Suite 600
Calverton, Maryland 20705

ECS Project No. 13:8624-A

Reference: Geotechnical Engineering Report
Urbana Elementary School Replacement - Phase II
3554 Urbana Pike
Frederick, Frederick County, Maryland

Dear Ms. Price:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 13:9763-GP, dated April 17, 2018 and revised on April 23, 2018. This report presents our understanding of the geotechnical aspects of the project, along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to Grimm & Parker during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Mid-Atlantic, LLC

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Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No.: 21607 Expiration Date: 05/29/2019

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APPENDICES

Appendix A – Drawings & Reports

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- Boring Location Diagram
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- Boring Logs (B-9 through B-22 and I-6) – Current Study
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- Plasticity Chart
- Grain Size Analysis
- Moisture-Density Relationship Curves

Appendix D – Supplemental Report Documents and Calculations

- Zone of Influence Diagram
- French Drain Installation Procedure

EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The current geotechnical exploration performed for the planned development included 14 soil test borings drilled to depths between approximately 10 and 20 feet. ECS previously completed 15 soil borings during Phase I (preliminary study), extended to depths of up to 20 feet. The results of the preliminary study are included with this report and were utilized in our current analysis of the site.
- Existing, undocumented fill materials were encountered at all of the current boring locations, as well as all preliminary boring locations except B-1, I-1, I-4, and I-5. The existing fill materials encountered were likely placed during the original school construction in 1959, and generally extended to depths of up to 13.5 feet below existing grades. Natural soils were encountered below the existing fill materials and extended to depths of up to 20 feet. The natural soils were classified as SILT (ML, ML/CL), GRAVEL (GM), and CLAY (CL, CL/ML).
- Weathered rock material was encountered in five (5) of the borings (B-1, B-4, B-9, B-12, and B-13) at depths of approximately 13.5 to 18.5 feet below existing grades (EL 430.5 to EL 417.5). Based on a lowest finished floor level at EL 446.08, excavation issues related to rock and weathered rock are not expected at this site.
- The planned school building can be supported by conventional shallow foundations consisting of individual column footings and continuous wall footings bearing on soils improved by aggregate piers. Details of the assumed foundation subgrade elevations and loads are contained in the body of the report. Foundations bearing over aggregate piers can be designed for a net allowable bearing pressure of 6,000 psf.
- The soils described above are generally expected to be suitable for reuse as engineered fill. Some of the on-site CL materials have elevated plasticity outside of the suitable limits for immediate reuse in structural areas. Moisture conditioning of subgrades and fill lifts may be required.
- Groundwater was encountered in five (5) borings (B-4, B-12, B-14, B-15, and B-19) at depths ranging from 12.0 feet to 20.0 feet below existing grades (EL 432.0 to EL 396.5). Considering the planned structure will be founded at or near existing grades (EL 446.08), groundwater is not expected to be a significant issue during construction.
- In-situ infiltration testing was performed at four (4) locations at depths of 4.18 to 9.8 feet below existing grades. The measured infiltration rates ranged from 0.06 to 0.72 inches per hour.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information for the design of the proposed school building and associated site improvements. The project will include the construction of a new two-story school building with associated site retaining walls, paved roadways, and stormwater management facilities.

The recommendations developed for this report are based on project information supplied by Grimm and Parker, Wolfman & Associates, and ADTEK. This report contains the results of our subsurface exploration and laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of planned school building and associated site improvements.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the new school building, retaining walls, roadways, and stormwater management facilities, 14 soil test borings were performed during our current exploration at locations selected by the structural engineer (Wolfmann & Associates) and civil engineer (ADTEK). These borings were located within the footprint of the proposed building and stormwater management facility locations. A laboratory-testing program was also implemented to characterize the physical and engineering properties of the subsurface soils.

Fifteen (15) borings completed during our preliminary study (Preliminary Geotechnical Engineering Report, dated July 3, 2018) are also included in our current analysis of the project site.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our test boring logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills and delineation of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling.
- Recommended foundation type(s).
- Recommendations for design and construction of site retaining walls.
- General recommendations for pavement design, including a recommended design CBR value.
- Evaluation and recommendations relative to groundwater control.
- Results of the infiltration testing.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 13:9763-GP, dated April 17, 2018 and revised on April 23, 2018, and authorized by Grimm and Parker on May 15, 2018, which includes the Terms and Conditions of Service.

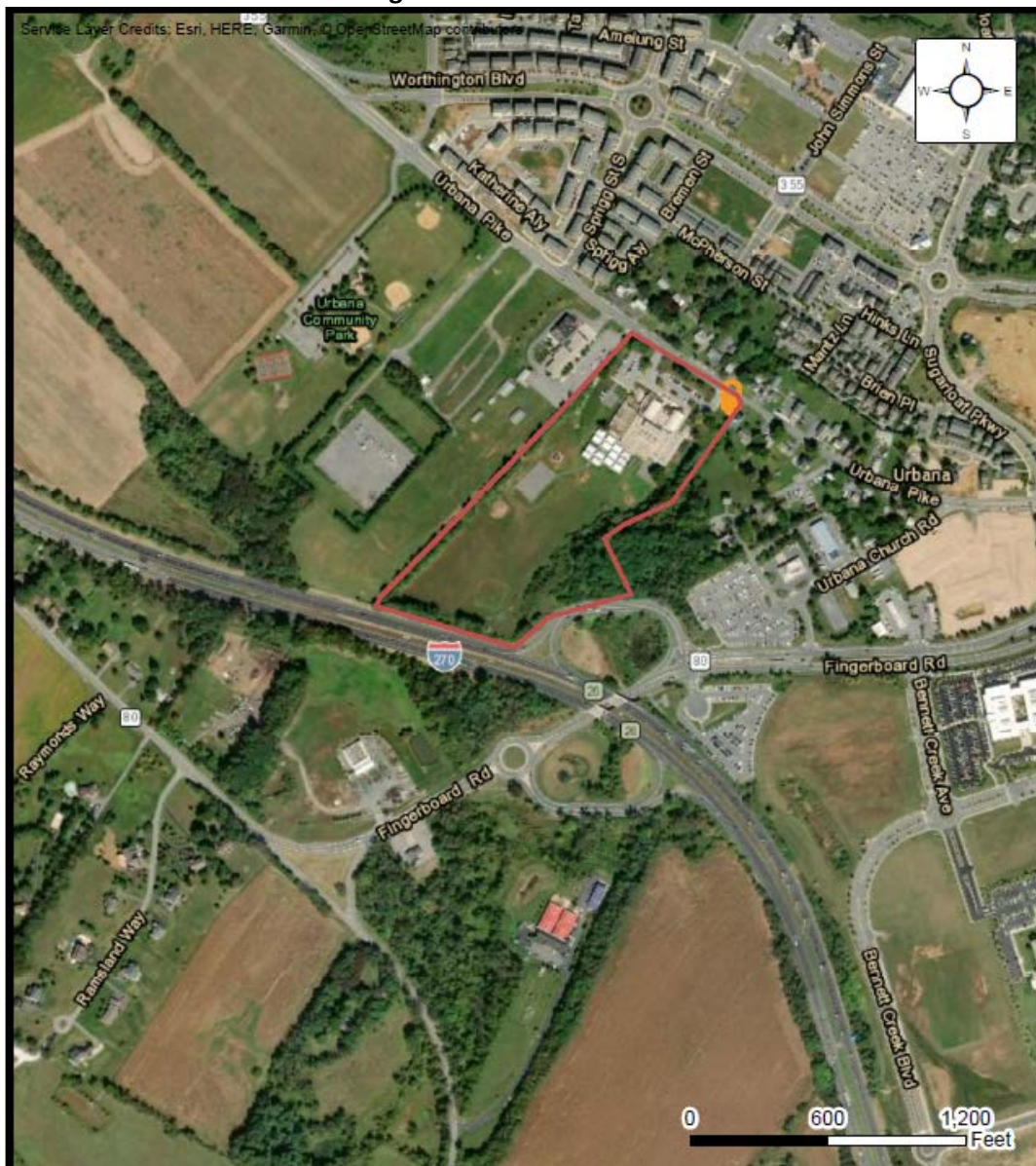
2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located on the southwest side of Urbana Pike, west of the intersection at Urbana Church Road, in Urbana, Maryland. Specifically, the site is bounded to the northwest by Urbana Fire & Rescue Services, to the northeast by Urbana Pike, on the southeast by single family homes along Urbana Pike and wooded land, and to the southwest by Interstate 270.

Figure 2.1.1 below shows the approximate project location. A Site Location Diagram has been included in Appendix A.

Figure 2.1.1. Site Location



2.2 PAST SITE HISTORY/USES

According to available online historic aerial imagery and topographic maps, and a review of ECS's Phase I ESA report dated May 21, 2018, the site was in use previously as agricultural and wooded land until 1959, when the previous school structure (which has since been demolished) was built on the property. Subsequent additions to the original school were constructed in 1965 and 1975.

The headwaters of the Urbana Branch of Bennett Creek are mapped to originate in the vicinity of the school parking lot, located in the north corner of the property. The tributary stream extended south through the property and appears to have extended through the southwest corner of the recently demolished school building.

2.3 CURRENT SITE CONDITIONS

Until recently, a school and associated parking lots occupied the northern portion of the site. The school, modular classrooms, and pavements have been demolished and the associated site utilities have been removed. The southern portion of the site is currently open grassed land and was previously utilized as athletic fields. There is a wetlands area (Great Heron Wetlands) located on the west side of the property.

The site can be considered relatively flat to slightly sloping with existing site grades ranging from approximately EL 454 along Urbana Pike to EL 433 in the east central portion of the site (extent of limits of disturbance).

2.4 PROPOSED CONSTRUCTION

The project will consist of the construction of a new two-story school building. Planned site improvements will include new paved parking and drive lanes and stormwater management facilities.

The site is relatively flat to slightly sloping with elevations within the footprint of the proposed building ranging from approximately EL 447 in the east corner of the building to EL 437 in the west corner of the building. Considering a finished floor level of EL 446.08, only minimal cuts will be required within a majority of the new building footprint. Fills on the order of about 10 feet will be necessary in the western portions of the building.

2.4.1 Site Civil Features

Two (2) site retaining walls are indicated on the site plan provided to us. Retaining Wall #1, located along the entrance drive and parking loop at the southeast corner of the site, will be approximately 370 feet long, with a maximum exposed height of approximately 6 to 8 feet based on existing grades. Retaining wall #2, located along the west side of the dumpster and generator pads, will be approximately 260 feet long, with a maximum exposed height of approximately 4 to 5 feet based on existing grades.

Multiple stormwater management features, likely consisting of micro bio-retention and infiltration trenches will be constructed around the site. Specific details regarding the size and depth of these facilities was not available at the time of this report.

2.4.1 Structural Information/Loads

The following information explains our understanding of the structures and their loads:

Table 2.4.1.1 Design Values

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Building Addition Footprint	Approximately 63,215 square feet in plan view.
# of Stories	2-story above grade (no below grade levels).
Usage	Elementary School
Framing	Slab on grade with structural steel framing and masonry bearing walls.
Column Loads	150 kips (Provided by Wolfman & Associates)
Wall Loads	5 kips per linear foot (klf) maximum (Provided by Wolfman & Associates)
Lowest Finish Floor Elevation	EL 446.08

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

3.1.1 Test Borings

The subsurface conditions for the current exploration program were explored by drilling thirteen (13) soil test borings within the proposed building footprint and one (1) soil test boring within the proposed stormwater management facility locations. A track-mounted drill rig was utilized to drill the soil test borings. Borings were generally advanced to depths of 10 to 20 feet below the current ground surface. Subsurface explorations were completed under the general supervision of an ECS geotechnical engineer or geologist.

Our preliminary exploration consisted of eight (8) soil test borings within the proposed building footprint, two (2) borings within the proposed retaining wall areas, and five (5) borings at proposed stormwater management facility locations.

Boring locations were identified in the field by ECS personnel by using GPS prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the topographic site plan provided to us, as prepared by ADTEK.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility. Bulk samples taken from the upper 3 to 7 feet of subsurface soils at several boring locations were obtained for subsequent laboratory testing.

3.1.2 Storm Water Infiltration Testing

In order to evaluate potential infiltration at this property, in-situ infiltration tests were performed in offset holes adjacent to test boring locations I-1 through I-5. The infiltration testing was performed at depths of 4.8 to 9.8 feet below existing grades. The Infiltration pipe installed at location I-6 was destroyed by others prior to testing and as such, infiltration testing was not conducted at this location.

The in-situ infiltration testing consisted of auguring a soil probe down to the test depth and installing a solid length of five inch diameter PVC pipe. The pipe was then pre-soaked for 24 hours by filling the pipe with approximately two feet of water. After the initial filling of the pipe, infiltration testing was completed by monitoring the drop in the water level at 60-minute intervals for four hours. The rate of drop over the four total hours is considered the infiltration rate.

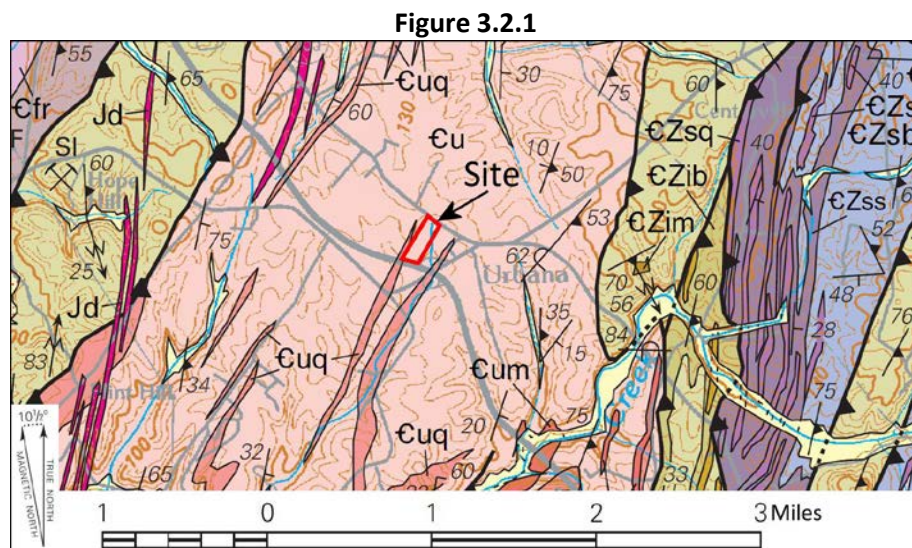
3.2 REGIONAL/SITE GEOLOGY

According to the Physiographic Map of Maryland (2008)¹, the site is located at the Mt. Airy Upland District of the Piedmont Plateau Province. The Piedmont Plateau Province is an area underlain by ancient igneous and metamorphic rock. The virgin soils encountered in this area are the residual product of in-place chemical weathering of the parent rock presently underlying the site. The typical residual soil profile consists of silty to clayey soils near the surface where soil weathering is more advanced, underlain by more sandy silts and silty sands that generally become harder and denser with depth to the top of parent bedrock. The boundary between soil and rock, termed weathered rock, is not sharply defined. This transitional zone can contain boulders of more resistant rock as well as highly weathered materials.

The Mt. Airy Upland District is described as rolling upland; herringbone texture due to interaction of thin siltstones and quartzites with stream reaches controlled by joints oblique to bedrock strike; streams often incised.

Based upon the Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia (2007)², the site is underlain by the Urbana Formation and Quartzite, both of the Sugarloaf Mountain Anticlinorium and Bush Creek Belt. The Urbana Formation is described as medium-olive-brown to light-olive-gray, poorly sorted, calcareous metasandstone, metagraywacke, quartzite, and metasiltstone. Contains graded beds, crossbeds, and sparse ripple marks. The Quartzite is described as light-olive-gray and light-brownish-gray, thin to medium-bedded, crossbedded, pitted, vuggy, friable, lensoidal and discontinuous, very calcareous metasandstone and quartzite. Interbedded with light-brown laminated metasiltstone.

An overview of the general site geology is illustrated in Figure 3.2.1.



Geologic map for Figure 3.2.1 obtained from the Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia (2007)

¹ James P. Reger and Emery T. Cleaves. *Physiographic Map of Maryland*. 1:250,000. Maryland Geological Survey, 2008.

² Scott Southworth, David K. Brezinski, Avery Ala Drake, Jr., William C. Burton, Randall C. Orndoff, Albert J. Frolich, James E. Reddy, Danielle Denenny, and David Daniels. *Geologic Map of the Frederick 30' x 60' Quadrangle, Maryland, Virginia, and West Virginia*. 1:100,000. U.S. Geological Survey and Maryland Geologic Survey, 2007.

3.3 SOIL SURVEY MAPPING

Based on our review of the Soil Survey [USDA - Natural Resources Conservation Service (websoilsurvey.nrcs.usda.gov)], the site soils are mapped as Linganore-Hyattstown channery silt loams (LyB and LyC), Myersville silt loams (MvA and MvB), and Rohrsersville-Lantz silt loams (RoB). These soil types are described with properties as illustrated in Figure 3.3.1.

Table 3.3.1 Soil Types

Unit Name		Typical Profile	Natural Drainage Class	Runoff Class	Depth to Groundwater Table	Depth to Restrictive Feature
Linganore-Hyattstown channery silt loams 3 to 8% slopes (LyB)	Linganore	0 to 13" channery loam 13 to 25" very channery loam 25 to 36" extremely channery loam 36 to 48" bedrock	Well drained	Medium	More than 80 inches	20 to 40 inches to paralithic bedrock
	Hyattstown	0 to 9" channery silt loam 9 to 14" very channery silt loam 14 to 18" extremely channery silt loam 18 to 26" weathered bedrock 26 to 30" unweathered bedrock	Well drained	Very high	More than 80 inches	10 to 20 inches to paralithic bedrock
Linganore-Hyattstown channery silt loams 8 to 15% slopes (LyC)	Linganore	0 to 13" channery loam 13 to 25" very channery loam 25 to 36" extremely channery loam 36 to 48" bedrock	Well drained	Medium	More than 80 inches	20 to 40 inches to paralithic bedrock
	Hyattstown	0 to 9" channery silt loam 9 to 14" very channery silt loam 14 to 18" extremely channery silt loam 18 to 26" weathered bedrock 26 to 30" unweathered bedrock	Well drained	Very high	More than 80 inches	10 to 20 inches to paralithic bedrock
Myersville silt loam 0 to 3% slopes (MvA)		0 to 12" silt loam 12 to 35" loam 35 to 61" clay loam 61 to 71" sandy loam 71 to 81" bedrock	Well drained	Low	More than 80 inches	60 to 80 inches to paralithic bedrock
Myersville silt loam 3 to 8% slopes (MvB)		0 to 12" silt loam 12 to 35" loam 35 to 61" clay loam 61 to 71" sandy loam 71 to 81" bedrock	Well drained	Medium	More than 80 inches	60 to 80 inches to paralithic bedrock
Rohrsersville-Lantz silt loams 0 to 8% slopes (RoB)	Rohrsersville	0 to 9" silt loam 9 to 31" silt loam 31 to 55" loam 55 to 62" loam 62 to 80" bedrock	Somewhat poorly drained	Very high	12 to 18 inches	24 to 36" to fragipan, 60 to 80" to paralithic bedrock
	Lantz	0 to 9" silt loam 9 to 14" silt loam 14 to 47" silt clay loam 47 to 72" gravelly loam	Poorly drained	Very high	0 to 6 inches	60 to 80 inches to paralithic bedrock

Soil mapping of the site vicinity is presented in Figure 3.3.2.

Figure 3.3.2



Soil Survey for Figure 3.3.2 obtained from USDA – Natural Resources Conservation Service; websoilsurvey.nrcs.usda.gov

3.4 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata encountered during our subsurface exploration and include information from the current study as well as the preliminary study performed previously. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Table 3.4.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Elevation (ft)	Stratum	Description	Ranges of SPT ⁽¹⁾ N-values (bpf)
0-0.67 ft (Surface cover)	EL 446.0-434.7	n/a	Preliminary Study - 3 to 4 inches of topsoil (B-1 through B-5, B-7, I-1 through I-5, RW-1 and RW-2). 8 inches of asphalt (B-6 and B-8). Current Study - Due to the recent demolition and grading activities at the site, surface cover was not present at the borings performed during the current study.	N/A
0.0 to 13.5 ft (FILL)	EL 446.0-430.5	I	Existing, undocumented fill materials (B-2 through B-22, I-2, I-3, and I-6).	3-35
2.5-20.0 ft	EL 445.2-416.5	II	Very Loose to Dense, SILT (ML), SAND (SM), and GRAVEL (GM, GP-GM), and Firm to Hard SILT (ML/CL) and CLAY (CL, CL/ML), Moist.	4 to 40
13.5-18.5 ft	EL 430.5-417.5	III	Weathered rock materials that exhibit rock like qualities. Portions of the weathered rock will require rock excavation methods to remove (B-1, B-4, B-9, B-12, and B-13).	>60

Notes: (1) Standard Penetration Test

3.5 GROUNDWATER OBSERVATIONS

Water levels were measured in our borings as noted on the soil boring logs in Appendix B. Groundwater depths measured at the time of drilling ranged from 12.0 feet to 20.0 feet below existing grades (EL 432.0 to EL 421.2). In borings where groundwater was not encountered, we observed borehole caving at depths of 2.0 to 12.6 feet which may be an indicator of groundwater presence.

Table 3.5.1 below outlines the depth and elevation groundwater was encountered at the boring locations.

Table 3.5.1 Groundwater Levels

Boring Location	Depth Groundwater Encountered (ft)	Approximate Elevation Groundwater Encountered (ft)
B-1	12.7	423.3
B-2	14.7	422.3
B-12	12.0	432.0
B-14	18.0	428.0
B-15	19.0	427.0
B-19	20.0	426.0
RW-1	13.8	421.2

It should be noted that fluctuations in the location of ground water conditions can occur as a result of seasonal variations in evaporation, precipitation, surface water run-off, localized perched water tables, and other factors not present at the time of the subsurface exploration. Long term water levels can vary considerably versus the depths at the time of drilling, especially considering the former stream located at this site. Perched water may be encountered at the interface of fill

and natural soils, at the interface of the clayey soil horizons, or at the interface of soils and weathered rock or bedrock.

As indicated in Section 2.2, a stream appears to have once extended from the parking lot to the north of the school through a portion of the previous school building, and then continued off site to the south. Groundwater levels within and adjacent to the historic stream channel are expected to be located near the original stream elevation. Pockets of perched groundwater are expected within the fill materials utilized to fill the stream channel.

It appears that the seasonal high groundwater level is located at a depth of approximately 12 feet below existing grades or EL 432.0. Based upon our interpretation of the data and a finished floor level of EL 446.08, it does not appear that groundwater will be a significant issue for the building; therefore special underslab drainage systems are not required.

4.0 LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program. Classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties.

Laboratory testing included moisture content testing, Atterberg Limits, washed sieve gradation analyses, and moisture-density relationships (Proctor). The results of the laboratory testing are included in Appendix C.

An experienced geotechnical engineer/engineering geologist visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and ASTM D-2488 (Description and Identification of Soils-Visual/Manual Procedures). After classification, the geotechnical engineer/engineering geologist grouped the various soil types into the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

5.0 DESIGN RECOMMENDATIONS

5.1 BUILDING DESIGN

The following sections provide recommendations for foundation design, soil supported slabs, retaining walls, seismic design parameters, and pavements.

5.1.1 Foundations

Based on the subsurface exploration, the soils anticipated at foundation subgrade levels (approximately EL 443) are expected to consist of existing fill materials (likely placed during the original building construction), or new compacted fill. No documentation exists regarding placement and compaction of the existing fill materials; therefore they will not be suitable for direct foundation support. It is likely not economical to undercut and replace the existing fills, therefore the proposed structure can be supported by shallow foundations (individual column footings and continuous wall footings) over ground improvement consisting of aggregate piers. The design of the foundation shall utilize the following parameters:

Table 5.1.1.1 Foundation Design

Design Parameter	Foundation Characteristics
Net Allowable Bearing Pressure ¹	6,000 psf
Acceptable Bearing Soil Material	Stratum I (Existing Fill) Improved by Aggregate Piers
Minimum Width	30 inches (columns) 18 inches (wall footings)
Minimum Footing Embedment Depth (below slab or finished grade)	30 inches (exterior) 18 inches (interior)
Estimated Total Settlement	1 inch
Estimated Differential Settlement	< 0.5 inches between columns < 0.5 inches over 50 feet (walls)

1. Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

Aggregate Piers: Due to the varying extent of existing fill expected below foundation subgrade levels, the materials at nominal bearing elevations will require ground improvement via aggregate piers. Aggregate piers are recommended to reinforce the subsoils in areas with unsuitable fill materials and loose soils, in order to support high capacity shallow spread footings. Aggregate piers are practical refinements to the traditional over-excavation and replacement method of strengthening subsoils for settlement control and bearing capacity improvement. Aggregate piers are constructed by drilling a hole to create a cavity, removing a volume of compressible or unsuitable subsoil materials, then building a bottom bulb of clean, open graded stone while vertically prestressing and prestraining subsoils underlying the bottom bulb.

For support of the building, aggregate piers with minimum shaft lengths of about 15 to 20 feet can be expected to provide a minimum support capacity of approximately 6,000 psf for spread footings and limit total settlement to less than one inch. Higher bearing pressures may be possible, and should be evaluated by the specialty contractor. The aggregate piers should be

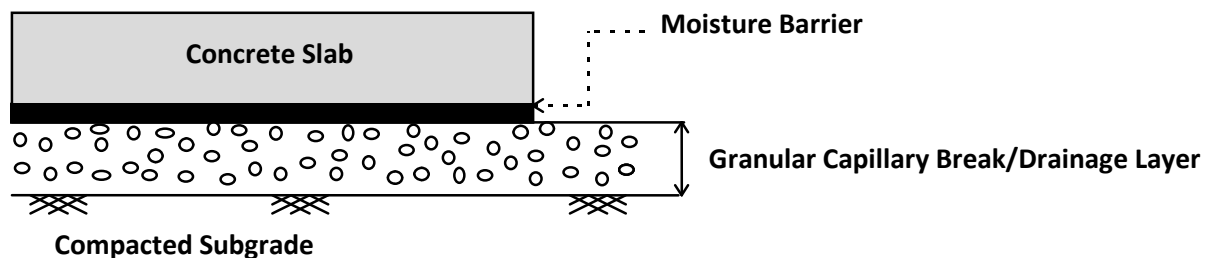
designed to fully extend through any existing fill materials. It should be noted that any new compacted structural fill should be placed before installation of the aggregate piers.

We recommend that you contact a specialty contractor to review and analyze the subsurface data contained in this report using available structural load and design information. After designing the support system, they will provide a full-scale Modulus Load Test on site to verify design assumptions. The test provides a conservative measure of the stiffness of the aggregate pier element and will help establish installation procedures for the project. ECS can coordinate with the aggregate pier installer to locate the load test in the weakest site area and provide full-time Quality Assurance monitoring services during the load test operations.

5.1.2 Floor Slabs

The on-site soils are generally considered suitable for support of the lowest floor slabs, although moisture control during earthwork operations, including the use of discing or appropriate drying equipment, may be necessary. Based on a lowest finished floor elevation of EL 446.08, it appears that the slabs for the new school building will bear mainly on the Stratum I existing FILL, or new compacted structural fill. These materials are likely suitable for the support of a slab-on-grade provided they are adequately compacted and free of any organics, construction/demolition debris, etc. There may be areas of soft or yielding soils that should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. When encountered at floor slab subgrade levels, any existing fill should be thoroughly evaluated by the Geotechnical Engineer via test pits, observation of utility excavations, and hand auger borings. The following graphic depicts our soil-supported slab recommendations:

Figure 5.1.2.1



1. Drainage Layer Thickness: 4 inches
2. Drainage Layer Material: GRAVEL (GP, GW)
3. Subgrade compacted to **98%** maximum dry density per ASTM D698

Subgrade Modulus: Provided the placement of Structural Fill and Granular Drainage Layer per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 100 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

Slab Isolation: Ground-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab, the slab should be designed with suitable

reinforcement and load transfer devices to preclude overstressing of the slab. Maximum differential settlement of soils supporting interior slabs is anticipated to be less than 1 inch in 40 feet.

5.1.3 Site Retaining Walls

Site retaining walls are often constructed from the "bottom-up" and therefore the type of soil used to backfill the wall is chosen or specified by contract. The lateral earth pressures developed behind site retaining walls is a function of the backfill soil type within an approximate 45-degree angle from the base of the wall upward.

Lateral Earth Pressures: Retaining walls should be designed to withstand the lateral earth pressures exerted by the backfill. The pressure diagram is triangular. It is anticipated that retaining walls associated with the project, will be rigid walls restrained from rotation by a slab. For rigid walls, the "At Rest" (k_o) soil condition should be used in the wall design and evaluation. For walls that are free to deflect at their tops, the "Active" (k_a) soil condition should be used in the wall design and evaluation. In the design of these retaining wall structures, the following soil parameters can be utilized. These parameters assume that Granular Soils meeting the requirements recommended herein for Retaining Wall Backfill will comprise the backfill in the Critical Zone. The Critical Zone is defined as the area between the back of the retaining wall structure and an imaginary line projected upward and rearward from the bottom back edge of the wall footing at a 45-degree angle.

Table 5.1.3.1 Retaining Wall Backfill in the Critical Zone

Soil Parameter	Estimated value
Coefficient of Earth Pressure at Rest (K_o)	0.50
Coefficient of Active Earth Pressure (K_a)	0.34
Retained Soil Moist Unit Weight (γ)	120 pcf
Cohesion (C)	0 psf
Angle of Internal Friction (ϕ)	30°
Friction Coefficient [Concrete on Soil] (μ)	0.35
At-rest Equivalent Fluid Pressure	60H (psf)
Active Equivalent Fluid Pressure	40H (psf)

Table 5.1.3.2 Foundation Soils (Natural Subgrades or Compacted Fill)

Soil Parameter	Estimated value
Allowable Net Soil Bearing Pressure**	3,000 psf
Minimum Wall Embedment Below Grade	30 inches
Coefficient of Passive Earth Pressure (K_p)	2.0
Soil Moist Unit Weight (γ)	120 pcf
Cohesion (C)	100 psf
Interface Friction Angle [Concrete on Soil] (ϕ_i)	18°
Sliding Friction Coefficient [Concrete on Soil] (μ)	0.32
Passive equivalent fluid pressure	240H (psf)

****Higher bearing pressures may be available depending on the wall location and foundation subgrade elevation. Retaining wall foundations should NOT bear directly on undocumented existing fill materials.** If present, any existing fill materials should be undercut and replaced. If extensive amounts of fill are expected to be present, it may be more practical to support the retaining wall foundations on ground improvement consisting of aggregate piers. Once final retaining wall layouts are available, additional details regarding potential bearing conditions at each retaining wall location can be provided.

Retaining Wall Backfill: All soils used as backfill within the Critical Zone behind retaining walls should have USCS classifications of Silty SAND (SM) or more granular with a maximum of 35% fines (i.e., % passing No. 200 Sieve size) and minimum angle of internal friction of 30 degrees when compacted to a minimum of 98% of its maximum dry density per ASTM D 698. Any existing soils not meeting these criteria should be removed from the Critical Zone of the walls, as determined by ECS personnel at the time of construction.

Foundation Drains: Retaining walls should be provided with a foundation drainage system to relieve hydrostatic pressures which may develop in the wall backfill. This system should consist of weepholes through the wall and/or a 4-inch perforated, closed joint drain line located along the backside of the walls above the top of the footing. The drain line should be surrounded by a minimum of 6 inches of AASHTO Size No. 57 Stone wrapped with an approved non-woven filter fabric, such as Mirafi 140-N or equivalent.

Wall Drains: All site retaining walls should be drained so that hydrostatic pressures do not build up behind the walls. Wall drains can consist of a 12-inch wide zone of free draining Gravel, such as AASHTO No. 57 Stone, employed directly behind the wall and separated from the soils beyond with a non-woven filter fabric. Alternatively, the wall drain can consist of a suitable geocomposite drainage board material. The wall drain should be hydraulically connected to the foundation drain.

5.1.4 Seismic Design Considerations

Seismic Site Classification: The International Building Code (IBC) 2015 requires site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The latter method (N-value method) was used in classifying this site.

The seismic site class definitions for the weighted average of shear wave velocity or SPT N-value in the upper 100 feet of the soil profile are shown in the following table:

Table 5.1.4.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, V_s , (ft./s)	N value (bpf)
A	Hard Rock	$V_s > 5,000$ fps	N/A
B	Rock	$2,500 < V_s \leq 5,000$ fps	N/A
C	Very dense soil and soft rock	$1,200 < V_s \leq 2,500$ fps	>50
D	Stiff Soil Profile	$600 \leq V_s \leq 1,200$ fps	15 to 50
E	Soft Soil Profile	$V_s < 600$ fps	<15

Utilizing the data obtained from the on-site boring exploration and our previous experience at neighboring sites, a mean SPT “N”-value between 15 and 50 blows per foot (bpf) is anticipated within 100 feet of the ground surface; therefore, the Seismic Site Class is **D**.

If it is determined that significant advantage could be gained with an improved Site Class, additional site testing could be performed to measure actual shear wave velocities using ReMi test methods along with a site specific analysis. ECS can provide additional consultation upon request.

Liquefaction: The subsurface profile consists primarily of residual soils derived from the in-place weathering of Metasiltstone rock. The subsurface conditions do not appear to exhibit liquefaction potential; therefore, it is our opinion that additional investigation regarding liquefaction potential is not necessary.

Ground Motion Parameters: In addition to the seismic site classification noted above, ECS has determined the design spectral response acceleration parameters following the IBC 2015 methodology. The Mapped Responses were estimated from the free Seismic Design Maps calculator available from the Structural Engineers Association of California website (<https://seismicmaps.org/>). The design responses for the short (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far right end of the following table.

Table 5.1.4.2: Ground Motion Parameters (IBC 2015 Method)

Period (sec)	Mapped Spectral Response Accelerations (g)		Values of Site Coefficient for Site Class		Maximum Spectral Response Acceleration Adjusted for Site Class (g)		Design Spectral Response Acceleration (g)	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_s	0.123	F_a	1.6	$S_{MS}=F_a S_s$	0.197	$S_{DS}=2/3 S_{MS}$	0.131
1.0	S_1	0.052	F_v	2.4	$S_{M1}=F_v S_1$	0.124	$S_{D1}=2/3 S_{M1}$	0.083

The Site Class definition should not be confused with the Seismic Design Category designation, which the Structural Engineer typically assesses. If a higher site classification is beneficial to the project, ECS would be pleased to discuss additional testing capabilities in this regard.

5.2 SITE DESIGN CONSIDERATIONS

5.2.1 Pavement Design

Subgrade Characteristics: Based on the results of our soil test borings, it appears that the soils that will be exposed as pavement subgrades will consist mainly of existing fill material, natural SILT (ML) and CLAY (CL) soils, or new compacted fill. These materials are expected to provide fair pavement support.

Considering our previous experience and knowledge of the geology in the area of the project site, the pavement subgrade soils should exhibit a California Bearing Ratio (CBR) value of 3 or greater. This CBR value should be confirmed prior to paving operations with laboratory testing. If materials are encountered near the surface that could exhibit a CBR value of less than 3, it is recommended that the upper 12 inches of this subgrade be undercut and replaced with suitable fill material exhibiting a CBR value of 3 or more. The pavement design assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 98 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D 698) in accordance with the project specifications.

Once the design pavement subgrade elevation is reached, the subgrade should be proofrolled and carefully observed at the time of construction in order to aid in identifying any localized soft or unsuitable materials. Soils which are still unstable after proofrolling will require undercutting and replacement with Engineered Fill. If site work is performed during the wetter winter months, the cohesive and moisture-sensitive subgrade soils subjected to wet conditions and/or ponding water may become unstable and require undercuts and replacement with dryer, suitable material. Exposed subgrade soils should be graded to drain surface moisture and covered as soon as possible with engineered fill compacted in accordance with project requirements.

Construction traffic should be confined to specific stabilized construction roads and not be allowed to degrade the pavement subgrade or new pavement section once it is placed.

All pavement materials and construction should be in accordance with the **Standards and Specifications for Construction Materials**, Maryland Department of Transportation, State Highway Administration, and any Frederick County requirements.

Rigid Concrete Pavements: For heavy-duty traffic areas, such as loading docks, bus pick-up/drop-off areas, dumpster or container storage yards, the Portland cement concrete pavement section should consist of 6 inches of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 psi, underlain by a minimum of 6 inches of compacted dense-graded aggregate subbase (CR-6 or GAB). The rigid pavement section should be provided with construction joints at appropriate intervals per PCA requirements. The construction joints should be reinforced with dowels to transfer loads across the joints.

Weather Restrictions: In this region, asphalt plants may close during the months of December, January, and/or February if particularly cold weather conditions prevail. However, this can change based on year to year temperature fluctuations. Daily temperatures from December to February will often stay below 40°F, limiting the days that asphalt placement can occur.

5.2.2 Stormwater Management Facilities

Stormwater management features are planned to be constructed around the site. We have assumed that the facilities will likely consist of a combination micro bio-retention, bio-swales, and infiltration trenches.

Infiltration Characteristics: Five (5) in-situ infiltration tests were completed at the site on May 30, 2018. The infiltration test results are shown in Table 5.2.2.1 below and in Appendix B.

Table 5.2.1.1 Infiltration Test Results

Test Location	Test Depth (ft)	Approximate Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
I-1	4.8	435.5	Medium Dense GRAVELLY SILT (ML)	0.48
I-2	9.3	432.0	Medium Dense SILT with SAND (ML)	0.57
I-3	4.8	437.5	Medium Dense SANDY SILT (ML)	0.72
I-4	4.9	438.0	Firm LEAN CLAY (CL)	0.06
I-5	9.8	431.5	Medium Dense SILT (ML)	0.39

Infiltration testing was not performed boring I-6 due to the infiltration pipe being damaged prior to testing.

The results reported above are based on field measurements. We recommend that the design rate be calculated as 2/3 of the field rate to account for siltation over time.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 SUBGRADE PREPARATION

6.1.1 Demolition

Demolition of the previous school building, concrete sidewalks, pavements, and existing utilities are ongoing at the site and are expected to have been completed prior to the start of new construction. Existing utilities and/or other subsurface structures related to the previous site usage are expected to have been removed and the resulting voids backfilled, per project recommendations, using well-compacted engineered fill. Abandoned pipes will not be allowed to remain beneath the building pad.

6.1.2 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, pavement, building/demolition debris, and any other soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits and to 5 feet beyond the toe of structural fills. ECS should be called on to verify that topsoil and unsuitable surficial materials have been completely removed prior to the placement of Structural Fill or construction of structures.

6.1.3 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill or other construction materials, the exposed subgrade should be examined by the Geotechnical Engineer or authorized representative. The exposed subgrade should be thoroughly proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the Geotechnical Engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or “pumping” subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning or chemical stabilization, should be discussed with the Geotechnical Engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. A test pit(s) may be excavated to explore the shallow subsurface materials in the area of the instability to help in determining the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

6.1.4 Site Temporary Dewatering

General Groundwater Conditions: Groundwater observations are described in Section 3.5 of this report. Groundwater within the proposed new school building can generally be characterized as being deeper than the planned excavation depths. Areas of perched groundwater may be encountered, particularly within the existing fill materials or in the vicinity of the previously mapped stream.

Subsurface Water: Based upon our subsurface exploration at this site, as well as significant experience on sites in nearby areas of similar geologic setting, we believe construction dewatering at this site will be limited to mainly removing perched water, accumulated rain water, and some seepage into excavations.

Deep wells will not be required for the temporary dewatering system. However, the dewatering operations can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches or French drains consisting of free draining granular stone wrapped in filter fabric to direct the flow of water and to remove water from the excavation. If temporary sump pits are used, we recommend they be established at an elevation 3 to 5 feet below the bottom of the excavation subgrade or bottom of footing. A perforated 55 gallon drum or other temporary structure could be used to house the pump.

Details of a typical french drainage installation are included as an attachment to this report. If utilized, the french drain should consist of a filter fabric lined trench filled with No. 57 stone or equivalent open graded stone. A minimum of 4-inch diameter PVC pipe should be placed in the stone bed to enhance water flow. After this installation has been completed, the filter fabric should be wrapped over the top of the gravel and pipe whereupon placement of fill may proceed to grade.

6.1.5 Subgrade Stabilization

Subgrade Benching: Fill should not be placed on ground with a slope steeper than 5H:1V, unless the fill is confined by an opposing slope, such as in a ravine. Otherwise, where steeper slopes exist, the ground should be benched so as to allow for fill placement on a horizontal surface.

Subgrade Compaction: Upon completion of subgrade documentation, the exposed subgrade within the 10-foot expanded building and 5-foot expanded pavement and embankment limits should be moisture conditioned to within -1 and +3 % of the soil's optimum moisture content and be compacted with suitable equipment (minimum 10-ton roller) to a depth of 10 inches. Subgrade compaction within the expanded building, pavement, and embankment limits should be to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper subgrade compaction has been achieved.

Subgrade Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits for buildings, pavements, fills, and slopes, etc. Field density testing of subgrades will be performed at frequencies in Table 6.1.5.1.

Table 6.1.5.1 Frequency of Subgrade Compaction Testing

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft.
Pavement Areas	1 test per 10,000 sq. ft.
Outparcels/SWM Facilities	1 test per 2,500 sq. ft.
All Other Non-Critical Areas	1 test per 10,000 sq. ft.

Subgrade Stabilization: Given the previous grading and deeper fill materials encountered in some areas of the site, zones of deep soft/wet soils may be present. Undercutting of excessively soft materials may be considered inefficient. In such areas the use of a reinforcing geotextile or geogrid might be employed, under the advisement of ECS. Suitable stabilization materials may include medium duty woven geotextile fabrics or geogrids. The suitability and employment of reinforcing or stabilization products should be determined in the field by ECS personnel, in accordance with project specifications.

6.2 EARTHWORK OPERATIONS

6.2.1 Existing Man-Placed Fill

Fill Content: Fill materials were encountered in 21 of the 22 borings performed within the proposed new school building footprint, and at three (3) of the SWM facility location borings. The fill materials extended to depths of up to 13.5 feet below existing grades. Additional fills are expected in areas of the site that were not explored, particularly along the below and within the footprint of the recently demolished school building. Based on a review of the fill materials, it appears that these fill materials were obtained from the general area, likely during the initial development of the site in 1959.

Fill Removal in Non-Building Areas: When encountered, all fill should be thoroughly evaluated by the Geotechnical Engineer via proofrolling. Any fill deemed unstable via the results of a proofroll should be removed from below the expanded fill removal limits of pavements and Structural Fill embankments. The expanded fill removal limits of pavements and Structural Fill embankments should be defined as that area directly below pavements and Structural Fill embankments, including the reinforced zone of MSE walls, and extending horizontally beyond the edge of these a distance of 1 horizontal foot for every vertical foot of Structural Fill depth above natural subgrade, but not less than 5 feet. ECS personnel should ascertain that fill removal has been suitably accomplished.

Fill Removal in Building Areas: Any existing fill encountered within foundation excavations should be removed per the recommendations provided in Section 5.1.1. Existing fills within planned slab on grade areas should be thoroughly evaluated during construction by the Geotechnical Engineer via proofrolling.

6.2.2 Weathered Rock

The excavation of soil and weathered rock can have a substantial impact on the cost and schedule of the proposed construction. This discussion considers two general classes of materials for

purposes of describing excavatability. Residuum and weathered rock will be used as the terms for the materials to be excavated.

In mass excavations for general site work, overburden soils with standard penetration test N-values of 30 bpf or less can usually be removed with conventional earth excavation equipment such as pans. Residual soils or soft weathered (saprolitic) rock with N-values of 30 to 60 bpf can generally be removed with conventional earth moving equipment after first being loosened with a large single-tooth ripper attached to a large crawler tractor. Very dense and hard soils and more decomposed phases of weathered rock (Stratum III) will generally require the use of a large single-tooth ripper, dozers, and/or track-mounted backhoes for excavation. Typically, weathered rock which can be penetrated by soil augers (such as those used in this subsurface exploration) can be excavated after being loosened with a large single-tooth ripper. However, materials exhibiting N-values of 50 blows for 1 inch of penetration, typically defined as refusal material, will be more difficult to excavate and generally require blasting and other rock excavation techniques. The actual excavatability of the bedrock material will be greatly controlled by in-situ jointing and bedding and may vary from location to location.

In confined excavations, such as utility trenches, excavation of dense residual soils typically requires the use of large track-mounted backhoes. Excavation of harder phases of weathered rock (Stratum III) typically requires the use of large track-mounted backhoes, pneumatic spades, or light blasting. Refusal materials (apparent rock) normally require blasting in trench excavations. Blasting in utility trenches must be done carefully to prevent damage to the surrounding materials at the toe of slopes.

Weathered rock was encountered at five (5) of the borings, typically at depths of 13.5 to 18.5 feet below existing grades (EL 430.5 to EL 417.5). Based on boring data obtained during the exploration, we anticipate that materials requiring difficult excavation techniques will generally be below the planned excavation depths at the site though some difficulties may be encountered in deep utility trenches.

6.2.3 Structural Fill Materials

Product Submittals: Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill should consist of inorganic soils classified as CL, ML, SM, SC, SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter, debris, and should contain no particle sizes greater than 4 inches in the largest dimension. Open graded materials, such as Gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric. Suitable Structural Fill material should have the index properties shown in Table 6.2.3.1.

Table 6.2.3.1 Structural Fill Index Properties

Location with Respect to Final Grade	LL	PI
Building Areas, upper 4 feet	40 max	15 max
Building Areas, below upper 4 feet	50 max	20 max
Pavement Areas, upper 2 feet	40 max	15 max
Pavement Areas, below upper 2 feet	50 max	20 max

Satisfactory Site Retaining Wall Backfill: All soils used as backfill within the Critical Zone behind retaining walls should have USCS classifications of Silty SAND (SM) or more granular with a maximum of 35% fines and minimum angle of internal friction of 30 degrees when compacted to a minimum of 98% of its maximum dry density per ASTM D 698. Any existing soils not meeting these criteria should be removed from the Critical Zone of the walls, as determined by ECS personnel at the time of construction.

Unsatisfactory Materials: Unsatisfactory fill materials include materials which do not satisfy the requirements for suitable materials, as well as topsoil and organic materials (OH, OL), elastic Silt (MH), and high plasticity Clay (CH). The Owner can consider allowing soils with a maximum Liquid Limit of 60 and Plasticity Index of 30 to be used as Structural Fill at depths greater than 4 feet below pavement subgrades outside the expanded building limits and within non-structural areas.

On-Site Borrow Suitability: Based on the results of the soil borings and laboratory testing performed, a majority of the on-site silty soils will be suitable for reuse provided they are conditioned as discussed here. However, given their plasticity some of the clay soils encountered will likely only be suitable for reuse below the upper 4 feet in building areas and below the upper 2 feet in pavement areas.

Optimum moisture content of the Proctor sample tested from boring RW-2 was 17.7%. Moisture conditioning of subgrades and fill lifts may be necessary, especially in the wetter months. Soil modification with Quick Lime or Calciment® should prove effective in reducing moisture contents of subgrades and fills.

6.2.4 Compaction

Structural Fill Compaction: Structural Fill within the expanded building, pavement, and embankment limits should be placed in maximum 8-inch loose lifts, moisture conditioned as necessary to within -1 and +3 % of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98% of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95% should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of the construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills will be performed at the frequencies shown in Table 6.2.4.1, but not less than 1 test per lift.

Table 6.2.4.1 Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Expanded Building Limits	1 test per 2,500 sq. ft. per lift
Pavement Areas	1 test per 10,000 sq. ft. per lift
Utility Trenches	1 test per 200 linear ft. per lift
Outparcels/SWM Facilities	1 test per 5,000 sq. ft. per lift
All Other Non-Critical Areas	1 test per 10,000 sq. ft. per lift

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. Sheepsfoot compaction equipment should be suitable for the fine-grained soils (Clays and Silts). A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of 4 inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils. Alternatively, if these soils cannot be stabilized by conventional methods as previously discussed, additional modifications to the subgrade soils such as lime or cement stabilization may be utilized to adjust the moisture content. If lime or cement are utilized to control moisture contents and/or for stabilization, Quick Lime, Calciment® or regular Type 1 cement can be used. The construction testing laboratory should evaluate proposed lime or cement soil modification procedures, such as quantity of additive and mixing and curing procedures, before implementation. The contractor should be required to minimize dusting or implement dust control measures, as required.

Where fill materials will be placed to widen existing embankment fills, or placed up against sloping ground, the soil subgrade should be scarified and the new fill benched or keyed into the existing material. Fill material should be placed in horizontal lifts. In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 inches to 4 inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture

within the fill during dry weather, but moisture control may be difficult during winter months or extended periods of rain. The control of moisture content of higher plasticity soils is difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

6.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: It will be important to have the geotechnical engineer of record observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1,000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete.

Slab Subgrade Verification: A representative of ECS should be called on to observe exposed subgrades within the expanded building limits prior to Structural Fill Placement to assure that adequate subgrade preparation has been achieved. A proofrolling using a drum roller or loaded dump truck should be performed in their presence at that time. Once subgrades have been prepared to the satisfaction of ECS, subgrades should be properly compacted and new Structural Fill can be placed. Existing subgrades to a depth of at least 10 inches and all Structural Fill should be moisture conditioned to within $-1/+3$ percentage points of optimum moisture content then be compacted to the required density. If there will be a significant time lag between the site grading work and final grading of concrete slab areas prior to the placement of the subbase stone and concrete, a representative of ECS should be called on to verify the condition of the prepared subgrade. Prior to final slab construction, the subgrade may require scarification, moisture conditioning, and re-compaction to restore stable conditions.

6.4 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrade should be observed and probed for stability by ECS to evaluate the suitability of the materials encountered. Any loose or unsuitable materials encountered at the utility pipe subgrade elevation should be removed and replaced with suitable compacted Structural Fill or pipe bedding material.

Utility Backfilling: The granular bedding material should be at least 4 inches thick, but not less than that specified by the project drawings and specifications. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill given in this report. Compacted backfill should be free of topsoil, roots, ice, or any other material

designated by ECS as unsuitable. The backfill should be moisture conditioned, placed, and compacted in accordance with the recommendations of this report.

Utility Excavation Dewatering: It is possible that perched water may be encountered by utility excavations which extend below existing grades. It is expected that removal of perched water which seeps into excavations could be accomplished by pumping from sumps excavated in the trench bottom and which are backfilled with DOT Size No. 57 Stone or open graded bedding material. Should water conditions beyond the capability of sump pumping be encountered, the contractor should submit a Dewatering Plan in accordance with project specifications.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.5 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

Erosion Control: The surface soils are considered to be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

7.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

The description of the proposed project is based on information provided to ECS by Grimm and Parker, Wolfman & Associates, and ADTEK. If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Location Diagram
Boring Location Diagram
Geologic Map
Soil Survey Map



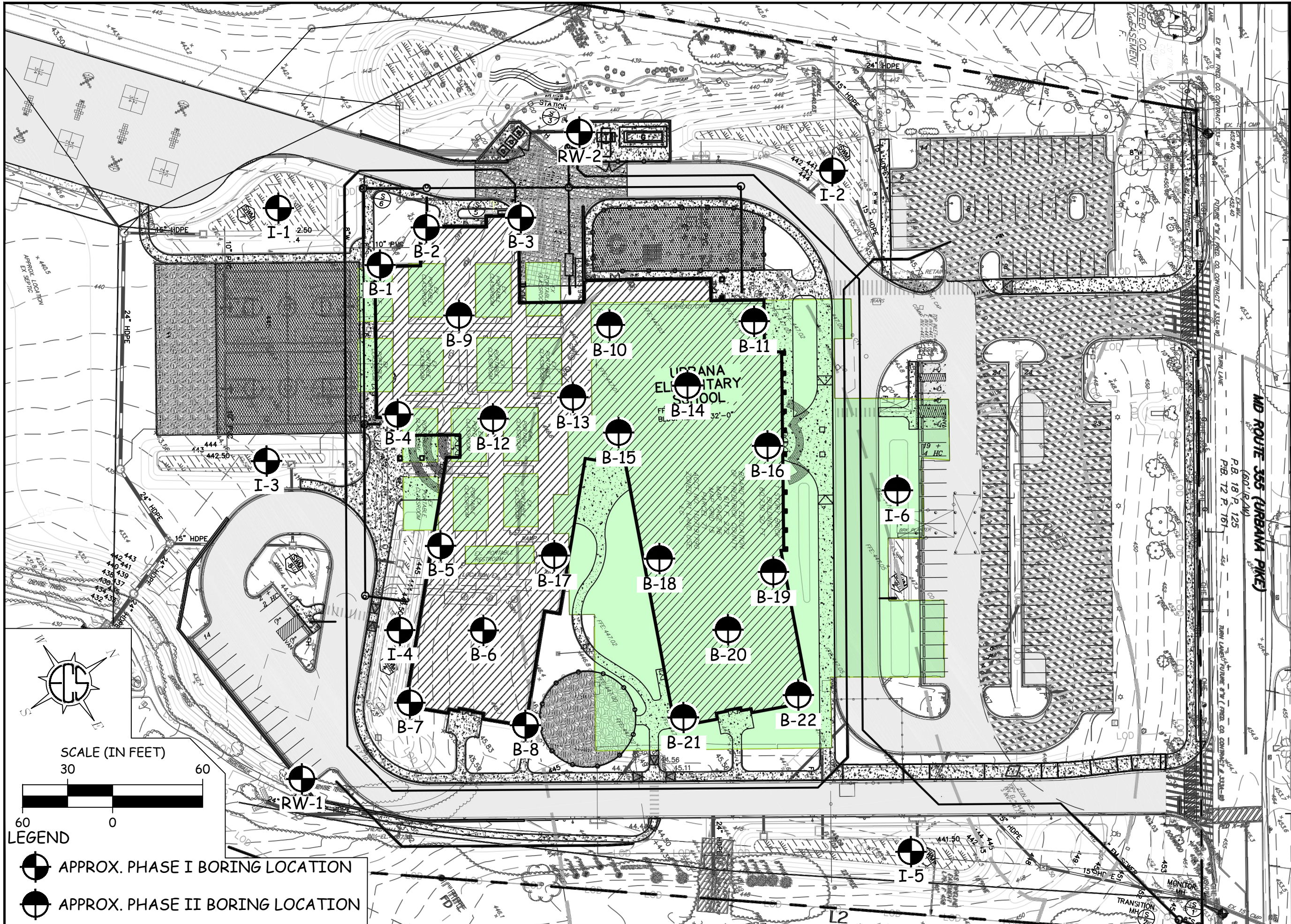
Notes: THE SITE IS OUTLINED IN RED



SITE LOCATION DIAGRAM **URBANA ELEMENTARY SCHOOL** **REPLACEMENT - PHASE II**

FREDERICK MD 21704
GRIMM & PARKER

ENGINEER	
SCALE	NTS
PROJECT NO.	13:8624-A
SHEET	1 OF 1
DATE	12/15/18

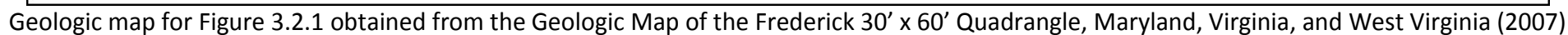


URBANA ELEMENTARY
SCHOOL REPLACEMENT - PHASE II
FREDERICK, MD



BORING LOCATION
DIAGRAM
GRIMM & PARKER

ECS REVISIONS	
ENGINEER	DRAFTING
BAM	AMH
SCALE	1" = 60'
PROJECT NO.	13-8624-A
SHEET	1 OF 1
DATE	12/05/18



Frederick, Frederick County, Maryland



Soil Survey image obtained from USDA – Natural Resources Conservation Service; websoilsurvey.nrcs.usda.gov

Appendix A – Drawings and Reports
Soil Survey Map
 ECS Project No. 13:8624-A



Urbana Elementary School Replacement Phase II
 3554 Urbana Pike
 Frederick, Frederick County, Maryland

APPENDIX B – Field Operations

Reference Notes for Boring Logs

Boring Logs – Current Study

(B-9 through B-22 and I-6)

Boring Logs – Preliminary Study

(B-1 through B-8, I-1 through I-5, RW-1, and RW-2)

Infiltration Test Results

CLIENT		Job #:		BORING #	SHEET
Grimm & Parker Arch.		13:8624-A		B-9	1 OF 1
PROJECT NAME Urbana Elementary School Replacement - Phase II		ARCHITECT-ENGINEER			
SITE LOCATION					
3554 Urbana Pike, Frederick, Frederick County, MD					
NORTHING		EASTING		STATION	
ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% ---					
PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%					
⊗ STANDARD PENETRATION BLOWS/FT					
○ CALIBRATED PENETROMETER TONS/FT ²					
DESCRIPTION OF MATERIAL ENGLISH UNITS					
BOTTOM OF CASING LOSS OF CIRCULATION					
SURFACE ELEVATION 442					
WATER LEVELS					
ELEVATION (FT)					
BLOWS/6"					
DEPTH (FT)					
SAMPLE NO.					
SAMPLE TYPE					
SAMPLE DIST. (IN)					
RECOVERY (IN)					
(CL/ML FILL) FILL, LEAN CLAY, trace sand, orange, moist, soft					
(ML FILL) FILL, SILT WITH SAND, trace clay, orangish brown, moist, loose					
(GP-GC FILL) FILL, GRAVEL WITH CLAY, orange to gray, moist, medium dense					
(ML/CL) CLAYEY SILT WITH SAND, tan, moist, stiff					
(WR) WEATHERED ROCK SAMPLED AS SILT, trace sand, orange to brown, moist, very dense [Weathered ROCK]					
(ML) SILT, trace sand, tan, moist, dense					
END OF BORING @ 20.00'					
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL None WS WD		BORING STARTED 12/10/18		CAVE IN DEPTH 12.5	
WL(SHW) WL(ACR) Dry		BORING COMPLETED 12/10/18		HAMMER TYPE Auto	
WL		RIG CME LC FOREMAN Sam C.		DRILLING METHOD HSA	

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-10	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING		EASTING		STATION		○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	
					BOTTOM OF CASING	LOSS OF CIRCULATION	
					SURFACE ELEVATION	446	
							WATER LEVELS ELEVATION (FT)
							BLOWS/6"
0	S-1	SS	18	15	(CL FILL) FILL, SANDY LEAN CLAY, orange to gray, moist, stiff		445
	S-2	SS	18	18	(ML/CL FILL) FILL, CLAYEY SILT, trace gravel, trace sand, trace clay, orange, moist, loose		440
5	S-3	SS	18	18			440
	S-4	SS	18	18	(GM) SILTY GRAVEL, trace sand, gray to orange, moist, dense		435
10							430
	S-5	SS	18	18	(ML) SILT WITH SAND, brown, moist, medium dense		430
15							425
	S-6	SS	18	18	(CL) SANDY LEAN CLAY, brown, moist, hard		420
20					END OF BORING @ 20.00'		425
25							420
30							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

<div style="display: flex; justify-content: space-between;"> <div> WL N/A WS <input type="checkbox"/> WD <input checked="" type="checkbox"/> </div> <div> BORING STARTED 12/10/18 CAVE IN DEPTH 5.0 </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> WL(SHW) WL(ACR) Dry </div> <div> BORING COMPLETED 12/10/18 HAMMER TYPE Auto </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> WL </div> <div> RIG CME LC FOREMAN Nick H. DRILLING METHOD HSA </div> </div>

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-11	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% ---			
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		ENGLISH UNITS
					BOTTOM OF CASING LOSS OF CIRCULATION		
					SURFACE ELEVATION 446		
					WATER LEVELS ELEVATION (FT)		BLOWS/6"
0	S-1	SS	18	12	(SP FILL) FILL, SANDY LEAN CLAY, gray and orange, moist, firm	445	5
	S-2	SS	18	18	(CL/ML FILL) FILL, SILTY CLAY, orange to brown, moist, stiff to firm	440	5
5	S-3	SS	18	18		440	2
	S-4	SS	18	18	(ML) SILT, trace sand, brown to tan, moist, medium dense to dense	435	4
10						430	4
	S-5	SS	18	18		430	9
15						425	8
	S-6	SS	18	18		420	14
20	END OF BORING @ 20.00'					425	21
25						420	
30						420	

CALIBRATED PENETROMETER TONS/FT²
 STANDARD PENETRATION BLOWS/FT

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

Depth (ft)	Blows/6"
0	7
5	12
10	7
15	11
20	20
20	35

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/A WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/10/18	CAVE IN DEPTH 2.0
WL(SHW) WL(ACR) Dry	BORING COMPLETED 12/10/18	HAMMER TYPE Auto
WL	RIG CME LC FOREMAN Nick H.	DRILLING METHOD HSA

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-12	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% 			
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS BOTTOM OF CASING LOSS OF CIRCULATION SURFACE ELEVATION 444	WATER LEVELS ELEVATION (FT)	BLOWS/6"
0	S-1	SS	18	16	(CL/ML FILL) FILL, SILTY CLAY, trace sand, orange, moist, soft		1 2 2
	S-2	SS	18	18	(CL FILL) FILL, LEAN CLAY, trace sand, orange, moist, firm	440	1 3 3
5	S-3	SS	18	18			3 3 3
	S-4	SS	18	14	(CL FILL) FILL, LEAN CLAY, gray, moist, soft, contains organic odor	435	1 2 2
10							
	S-5	SS	10	10	(WR) WEATHERED ROCK SAMPLED AS SILTY GRAVEL, gray, moist, very dense [Weathered ROCK]	430	28 50/4
15							
	S-6	SS	10	10	(WR) WEATHERED ROCK SAMPLED AS GRAVEL WITH SILT, dark gray to brown, moist, very dense [Weathered ROCK] END OF BORING @ 19.33'	425	29 50/4
20							
25							
30							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL 13.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED		12/10/18		CAVE IN DEPTH 13.0	
WL(SHW) WL(ACR) 12.0		BORING COMPLETED		12/10/18		HAMMER TYPE Auto	
WL		RIG CME LC		FOREMAN Sam C.		DRILLING METHOD HSA	

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A		BORING # B-13		SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER						
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> ○ CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% X WATER CONTENT% ● LIQUID LIMIT% △ ⊗ STANDARD PENETRATION BLOWS/FT </div> </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"		
					BOTTOM OF CASING	LOSS OF CIRCULATION				
					SURFACE ELEVATION 446					
0	S-1	SS	18	12	(CL FILL) FILL, LEAN CLAY, trace sand, trace gravel, trace silt, orange, moist, soft to firm		445	2	2	2
	S-2	SS	18	18				3	3	3
5	S-3	SS	18	13			440	1	2	1
	S-4	SS	18	17	(CL/ML) SILTY CLAY, brown, moist, firm			6	2	4
10							435			
	S-5	SS	18	18	(ML) SILT WITH SAND, brown, moist, medium dense			4	5	6
15							430			
	S-6	SS	6	6	(WR) WEATHERED ROCK SAMPLED AS SILT WITH GRAVEL, trace sand, tan to brown, moist, very dense [Weathered ROCK]			50/6		
20					END OF BORING @ 19.00'		425			
25							420			
30										
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.										
WL N/A		WS <input type="checkbox"/>		WD <input checked="" type="checkbox"/>		BORING STARTED 12/10/18		CAVE IN DEPTH 4.5		
WL(SHW)		WL(ACR) Dry				BORING COMPLETED 12/10/18		HAMMER TYPE Auto		
WL						RIG CME LC FOREMAN Nick H.		DRILLING METHOD HSA		

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-14	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT
0					BOTTOM OF CASING LOSS OF CIRCULATION SURFACE ELEVATION 446			
0	S-1	SS	18	15	(CL/ML FILL) FILL, SILTY CLAY, trace gravel, trace sand, orange to brown, moist, stiff		445	10
1								
2	S-2	SS	18	18	(ML FILL) FILL< SILT WITH SAND, orange, moist, loose		445	10
3								
4	S-3	SS	18	18	(CL FILL) FILL, SANDY LEAN CLAY, orange, moist, firm		440	6
5								
6	S-4	SS	18	11	(ML) SILT WITH SAND, tan, moist, medium dense		435	15
7								
8								
9								
10								
11	S-5	SS	18	13	(ML) SILT WITH SAND, trace gravel, brown to tan, moist, medium dense		430	13
12								
13								
14								
15								
16								
17	S-6	SS	18	17			425	24
18								
19								
20					END OF BORING @ 20.00'		425	
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 18.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/10/18	CAVE IN DEPTH 4.0
WL(SHW) WL(ACR) Dry	BORING COMPLETED 12/10/18	HAMMER TYPE Auto
WL	RIG CME LC FOREMAN Nick H.	DRILLING METHOD HSA

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-15	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT
0					BOTTOM OF CASING LOSS OF CIRCULATION SURFACE ELEVATION 446			
0	S-1	SS	18	14	(CL/ML FILL) FILL, SILTY CLAY, orange to brown, moist, stiff		445	10
	S-2	SS	18	18				11
5	S-3	SS	18	18	(ML/CL FILL) FILL, CLAYEY SILT, trace sand, orange to brown, moist, firm to very stiff		440	6
	S-4	SS	18	18	(ML) SILT WITH SAND, tan, moist medium dense		435	18
15	S-5	SS	18	18	(ML) SILT WITH SAND, trace gravel, dark brown, moist, very loose		430	4
20	S-6	SS	18	18	(ML) SILT, trace sand, brown, moist, loose		425	7
20					END OF BORING @ 20.00'		425	
25							420	
30								
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.								
WL 19.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED		12/10/18		CAVE IN DEPTH 4.0		
WL(SHW) WL(ACR) Dry		BORING COMPLETED		12/10/18		HAMMER TYPE Auto		
WL		RIG CME LC		FOREMAN Nick H.		DRILLING METHOD HSA		

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-16	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
<div style="display: flex; justify-content: space-between;"> <div style="width: 20%;">NORTHING</div> <div style="width: 20%;">EASTING</div> <div style="width: 40%;">STATION</div> </div>				<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> —○— CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— </div> <div style="width: 30%;"> PLASTIC LIMIT% × </div> <div style="width: 30%;"> WATER CONTENT% ● </div> <div style="width: 30%;"> LIQUID LIMIT% △ </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT
					BOTTOM OF CASING LOSS OF CIRCULATION			
					SURFACE ELEVATION 446			
0	S-1	SS	18	14	(SP FILL) FILL, SAND, gray, moist, medium dense		445	30
	S-2	SS	18	18	(ML FILL) FILL, SILT WITH SAND, orange, moist, loose		440	10
5	S-3	SS	18	18	(ML/CL FILL) FILL, CLAYEY SILT, trace sand, brown, moist, firm		440	7
	S-4	SS	18	18	(ML) SILT WITH SAND, grayish brown, moist, medium dense		435	22
10							430	16
15	S-5	SS	18	16			430	17
	S-6	SS	18	18			425	
20					END OF BORING @ 20.00'		425	
25							420	
30								


THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/A	WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED 12/10/18	CAVE IN DEPTH 3.5
WL(SHW)	WL(ACR) Dry		BORING COMPLETED 12/10/18	HAMMER TYPE Auto
WL			RIG CME LC FOREMAN Nick H.	DRILLING METHOD HSA

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-17	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT
0	S-1	SS	18	16	(CL FILL) FILL, LEAN CLAY, trace sand, trace gravel, orange, moist, firm	LOSS OF CIRCULATION	445	6
	S-2	SS	18	18				5
5	S-3	SS	18	18	(ML/CL FILL) FILL, CLAYEY SILT, orange, moist, firm		440	7
	S-4	SS	18	18	(ML) SILT, trace sand, tan, moist, loose to medium dense		435	9
10								
	S-5	SS	18	18			430	8
15								
	S-6	SS	18	18			425	11
20					END OF BORING @ 20.00'			
25								
30								
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.								
WL None WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED		12/10/18		CAVE IN DEPTH 12.0		
WL(SHW) WL(ACR) Dry		BORING COMPLETED		12/10/18		HAMMER TYPE Auto		
WL		RIG CME LC		FOREMAN Sam C.		DRILLING METHOD HSA		

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A		BORING # B-18		SHEET 1 OF 1																																																																																																																									
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER																																																																																																																													
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD																																																																																																																																	
NORTHING				EASTING		STATION				○ CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT																																																																																																																							
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CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-19	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/ft
					BOTTOM OF CASING LOSS OF CIRCULATION			
					SURFACE ELEVATION 446			
0	S-1	SS	18	16	(SP FILL) FILL, SAND, gray, moist, medium dense		445	18
	S-2	SS	18	14	(CL FILL) FILL, SANDY LEAN CLAY, orange to gray, moist, firm		443	7
5	S-3	SS	18	18	(CL/ML FILL) FILL, SILTY CLAY, trace sand, brown to orange, moist, firm		440	7
	S-4	SS	18	18	(ML) SILT WITH SAND, trace clay, tan, moist, medium dense		435	14
15	S-5	SS	18	14	(ML) SILT WITH SAND, trace gravel, brown, moist, medium dense		430	16
20	S-6	SS	18	18	(ML) SILT WITH SAND, brown, moist, medium dense		425	14
					END OF BORING @ 20.00'		425	
25							420	
30								
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WL 20.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/10/18		CAVE IN DEPTH 11.5				
WL(SHW) WL(ACR) Dry		BORING COMPLETED 12/10/18		HAMMER TYPE Auto				
WL		RIG CME LC FOREMAN Sam C.		DRILLING METHOD HSA				

CLIENT		Job #:		BORING #		SHEET		<div></div>																																																																																																												
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CLIENT Grimm & Parker Arch.				Job #: 13:8624-A	BORING # B-22	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase II				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT
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					SURFACE ELEVATION 445.5			
0	S-1	SS	18	16	(CL FILL) FILL, SANDY LEAN CLAY, trace gravel, orange, moist, firm		445	6
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5	S-3	SS	18	18	(CL/ML) CLAYEY SILT, trace sand, orangish brown, moist, stiff		440	13
	S-4	SS	18	18	(ML) SILT WITH SAND, tan to dark brown, moist, loose to medium dense		435	10
10							430	
	S-5	SS	18	18			430	10
15							425	
	S-6	SS	18	18			425	11
20					END OF BORING @ 20.00'		425	
25							420	
30							415	
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WL None WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/10/18		CAVE IN DEPTH 11.6				
WL(SHW) WL(ACR) Dry		BORING COMPLETED 12/10/18		HAMMER TYPE Auto				
WL		RIG CME LC FOREMAN Sam C.		DRILLING METHOD HSA				

CLIENT Grimm & Parker Arch.				Job #: 13:8624-A		BORING # I-6		SHEET 1 OF 1																																																																																																																																										
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">DEPTH (FT)</th> <th rowspan="2">SAMPLE NO.</th> <th rowspan="2">SAMPLE TYPE</th> <th rowspan="2">SAMPLE DIST. (IN)</th> <th rowspan="2">RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th rowspan="2">WATER LEVELS ELEVATION (FT)</th> <th rowspan="2">BLOWS/FT</th> </tr> <tr> <th>BOTTOM OF CASING</th> <th>LOSS OF CIRCULATION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>S-1</td> <td>SS</td> <td>18</td> <td>10</td> <td>(CL FILL) FILL, LEAN CLAY, trace sand, orange, moist, stiff</td> <td></td> <td>445</td> <td>3</td> </tr> <tr> <td></td> <td>S-2</td> <td>SS</td> <td>18</td> <td>17</td> <td>(ML/CL) FILL, CLAYEY SILT, brown, moist firm</td> <td></td> <td></td> <td>4</td> </tr> <tr> <td>5</td> <td>S-3</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML) SANDY SILT, trace clay, red, moist, medium dense</td> <td></td> <td>440</td> <td>6</td> </tr> <tr> <td></td> <td>S-4</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML) SILT, trace sand, gray to brown, moist, medium dense</td> <td></td> <td></td> <td>2</td> </tr> <tr> <td>10</td> <td colspan="4"></td> <td>END OF BORING @ 10.00'</td> <td></td> <td>435</td> <td>3</td> </tr> <tr> <td></td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td>5</td> </tr> <tr> <td>15</td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td>8</td> </tr> <tr> <td></td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td>9</td> </tr> <tr> <td>20</td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td>7</td> </tr> <tr> <td></td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>25</td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td colspan="4"></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT	BOTTOM OF CASING	LOSS OF CIRCULATION	0	S-1	SS	18	10	(CL FILL) FILL, LEAN CLAY, trace sand, orange, moist, stiff		445	3		S-2	SS	18	17	(ML/CL) FILL, CLAYEY SILT, brown, moist firm			4	5	S-3	SS	18	18	(ML) SANDY SILT, trace clay, red, moist, medium dense		440	6		S-4	SS	18	18	(ML) SILT, trace sand, gray to brown, moist, medium dense			2	10					END OF BORING @ 10.00'		435	3									5	15								8									9	20								7										25																		30																
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/FT																																																																																																																																										
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5	S-3	SS	18	18	(ML) SANDY SILT, trace clay, red, moist, medium dense		440	6																																																																																																																																										
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WL N/A		WS <input type="checkbox"/>		WD <input checked="" type="checkbox"/>		BORING STARTED 12/10/18		CAVE IN DEPTH 6.1																																																																																																																																										
WL(SHW)		WL(ACR) Dry				BORING COMPLETED 12/10/18		HAMMER TYPE Auto																																																																																																																																										
WL						RIG CME LC FOREMAN Sam C.		DRILLING METHOD HSA																																																																																																																																										

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-1	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							

NORTHING	EASTING	STATION					
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DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [3.00"] (ML) SILT, trace sand, orange, moist, loose to medium dense			435	2
	S-1	SS	18	18					2
	S-2	SS	18	18					3
5									4
	S-3	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense			430	5
	S-4	SS	18	16	(ML) SANDY SILT WITH GRAVEL, tan, moist, medium dense				8
10									9
	S-5	SS	18	15	(GP-GM) GRAVEL WITH SILT And SAND, brown, moist, dense			425	7
									10
15									13
	S-6	SS	11	8	(WR) WEATHERED ROCK SAMPLED AS GRAVEL WITH SAND, brown, moist, very dense [Weathered ROCK] END OF BORING @ 19.42'			420	31
20									50/5
25									
30									

ROCK QUALITY DESIGNATION & RECOVERY
RQD% - - - REC% - - -

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

○ CALIBRATED PENETROMETER TONS/FT²

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 14.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 14.0'
WL(SHW) WL(ACR) 12.7	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-2	SHEET 1 OF 1			
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER					
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD									
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ———					
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"	PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%
					BOTTOM OF CASING LOSS OF CIRCULATION				
					SURFACE ELEVATION 437				
0					Topsoil Depth [3.00"] (ML FILL) SILT, trace sand, trace clay, contains slight roots, light brown, moist, loose		435	2	
	S-1	SS	18	18				3	
								4	
	S-2	SS	18	18				5	
5								6	
	S-3	SS	18	18	(ML) GRAVELLY SILT WITH SAND, orange and black, moist, medium dense		430	7	
								8	
	S-4	SS	18	18	(GP-GM) GRAVEL WITH SILT And SAND, orange and black, moist, medium dense		425	9	
10								10	
	S-5	SS	18	18	(ML) SILT WITH SAND, black, moist, medium dense, contains organics		420	11	
15								12	
	S-6	SS	18	18	(ML) SILT, trace sand, tan, moist, medium dense		415	13	
20					END OF BORING @ 20.00'		410	14	
25								15	
30								16	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 15.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 14.8'
WL(SHW) WL(ACR) 14.7	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA


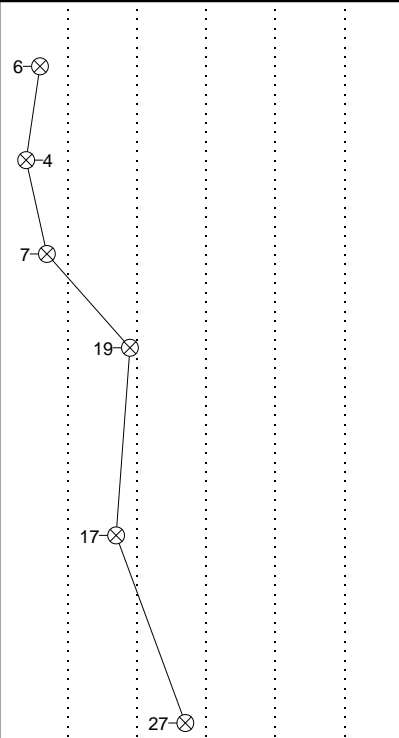
CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-3	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							

NORTHING	EASTING	STATION	ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT
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DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [3.00"] (ML FILL) FILL, SILT WITH SAND, trace gravel, orangish brown, moist, loose			440	
1	S-1	SS	18	18					6
2									3
3	S-2	SS	18	16					5
4									2
5									3
6	S-3	SS	18	0	(GP FILL) FILL, GRAVEL, gray, moist, loose			435	6
7									3
8									3
9	S-4	SS	18	18	(ML) SILT, trace sand, trace gravel, trace clay, orangish brown, moist, loose				10
10									4
11									6
12									
13									
14	S-5	SS	18	18	(ML) SILT, trace sand, tan to brown, moist, medium dense				26
15									8
16									11
17									15
18									
19									
20	S-6	SS	18	18					30
21									8
22									14
23									16
24									
25									
26									
27									
28									
29									
30					END OF BORING @ 20.00'				
31									
32									
33									
34									
35									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL	WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED	05/29/18	CAVE IN DEPTH @ 12.9'
WL(SHW)	WL(ACR)	Dry	BORING COMPLETED	05/29/18	HAMMER TYPE Auto
WL			RIG	CME 550	FOREMAN Dale Price
					DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # B-5	SHEET 1 OF 1		
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER				
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD								
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% --- PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ● △ ⊗ STANDARD PENETRATION BLOWS/FT				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [4.00"] (ML FILL) SANDY SILT, trace gravel, orangish brown, moist, loose	LOSS OF CIRCULATION	440	8 ⊗
5	S-1	SS	18	14	(ML) SILT, trace sand, reddish brown, moist, medium dense		440	11 ⊗
	S-2	SS	18	18	(ML) SILT, trace sand, trace gravel, brownish orange to tan, moist, medium dense		435	12 ⊗
	S-3	SS	18	18			430	13 ⊗
10	S-4	SS	18	18			425	21 ⊗
15	S-5	SS	18	18	(SM) SILTY SAND, trace gravel, tan, moist, medium dense to dense		420	32 ⊗
20	S-6	SS	18	18	END OF BORING @ 20.00'		415	
25								
30								
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.								
WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED		05/23/18		CAVE IN DEPTH @ 15.8'		
WL(SHW) WL(ACR) Dry		BORING COMPLETED		05/23/18		HAMMER TYPE Auto		
WL		RIG CME 550		FOREMAN Dale Price		DRILLING METHOD HSA		

CLIENT		Job #:		BORING #		SHEET																																																																																																																																																																																									
Grimm & Parker		13:8624		B-7		1 OF 1																																																																																																																																																																																									
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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL	WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 16.1'
WL(SHW)	WL(ACR) Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Auto
WL		RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # I-1	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT			
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)
					BOTTOM OF CASING LOSS OF CIRCULATION		
					SURFACE ELEVATION 440.5		
0					Topsoil Depth [4.00"]		440
	S-1	SS	18	14	(ML) SILT, trace gravel, trace sand, brownish red, moist, loose		438
							436
	S-2	SS	18	16	(ML) GRAVELLY SILT, brownish red, moist, medium dense		435
5							434
	S-3	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense		433
							432
	S-4	SS	18	18	(ML) SILT WITH SAND, dark brown, moist, medium dense		431
10					END OF BORING @ 10.00'		430
15							425
20							420
25							415
30							410

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.








WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/23/18	CAVE IN DEPTH @ 7.2'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 05/23/18	HAMMER TYPE Manual
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # I-2	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% 			
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS
					BOTTOM OF CASING	LOSS OF CIRCULATION	
					SURFACE ELEVATION 441.5		
0					Topsoil Depth [3.00"]		
	S-1	SS	18	16	(ML FILL) GRAVELLY SILT, trace sand, red, moist, very loose		440
	S-2	SS	18	18	(ML) SANDY SILT, trace gravel, orangish brown, moist, loose		435
5	S-3	SS	18	18	(ML) SILT WITH SAND, trace gravel, orangish brown, moist, medium dense		430
	S-4	SS	18	18			425
10							420
	S-5	SS	18	18	(ML) SANDY SILT, light brown, moist, medium dense		415
15					END OF BORING @ 15.00'		
20							
25							
30							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18	CAVE IN DEPTH @ 12.2'
WL(SHW) WL(ACR) Dry	BORING COMPLETED 05/29/18	HAMMER TYPE Auto
WL	RIG CME 550 FOREMAN Dale Price	DRILLING METHOD HSA

CLIENT Grimm & Parker				Job #: 13:8624	BORING # RW-1	SHEET 1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION 3554 Urbana Pike, Frederick, Frederick County, MD							
NORTHING		EASTING		STATION		○— CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ————— ● ————— △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)
					BOTTOM OF CASING	LOSS OF CIRCULATION	
					SURFACE ELEVATION	435	
0					Topsoil Depth [4.00"]		435
	S-1	SS	18	18	(ML) GRAVELLY SILT WITH SAND, brown, moist, loose		3 3 4
	S-2	SS	18	18	(SM) SILTY SAND, trace gravel, brownish red, moist, medium dense		4 6 8
5	S-3	SS	18	18			4 7 9
	S-4	SS	18	18	(ML) SANDY SILT, trace gravel, tan, moist, medium dense		4 5 6
10							
	S-5	SS	18	18	(ML) SILT WITH SAND, tan, moist, loose to medium dense		3 4 6
15							
	S-6	SS	18	18			4 7 9
20	END OF BORING @ 20.00'						415
25							410
30							405
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL 15.0		WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED 05/29/18		CAVE IN DEPTH @ 14.1'	
WL(SHW)		WL(ACR) 13.8		BORING COMPLETED 05/29/18		HAMMER TYPE Auto	
WL				RIG CME 550 FOREMAN Dale Price		DRILLING METHOD HSA	

CLIENT		Job #:		BORING #		SHEET					
Grimm & Parker				13:8624		RW-2				1 OF 1	
PROJECT NAME Urbana Elementary School Replacement - Phase I				ARCHITECT-ENGINEER							
SITE LOCATION											
3554 Urbana Pike, Frederick, Frederick County, MD											
NORTHING			EASTING			STATION			ROCK QUALITY DESIGNATION & RECOVERY RQD% --- REC% ---		
<div> <div> <div>DEPTH (FT)</div> <div>0</div> <div>5</div> <div>10</div> <div>15</div> <div>20</div> <div>25</div> <div>30</div> </div> <div> <div>SAMPLE NO.</div> <div>S-1</div> <div>S-2</div> <div>S-3</div> <div>S-4</div> <div>S-5</div> <div>S-6</div> </div> <div> <div>SAMPLE TYPE</div> <div>SS</div> <div>SS</div> <div>SS</div> <div>SS</div> <div>SS</div> <div>SS</div> </div> <div> <div>SAMPLE DIST. (IN)</div> <div>18</div> <div>18</div> <div>18</div> <div>18</div> <div>18</div> <div>18</div> </div> <div> <div>RECOVERY (IN)</div> <div>14</div> <div>16</div> <div>18</div> <div>18</div> <div>18</div> <div>18</div> </div> <div> <div>DESCRIPTION OF MATERIAL</div> <div> Topsoil Depth [4.00"] (CL) CLAY WITH SAND, trace gravel, orangish brown, moist, firm </div> <div> (ML) SILT WITH SAND, trace gravel, tan, moist, medium dense </div> <div> (ML) SANDY SILT WITH GRAVEL, gray to light brown, moist, medium dense to dense </div> <div>END OF BORING @ 20.00'</div> </div> <div> <div>ENGLISH UNITS</div> <div> BOTTOM OF CASING  LOSS OF CIRCULATION  </div> <div>SURFACE ELEVATION 445.5</div> </div> <div> <div>WATER LEVELS</div> <div>ELEVATION (FT)</div> <div>445</div> <div>440</div> <div>435</div> <div>430</div> <div>425</div> <div>420</div> <div>415</div> </div> <div> <div>BLOWS/6"</div> <div>2</div> <div>3</div> <div>4</div> <div>2</div> <div>3</div> <div>5</div> <div>6</div> <div>4</div> <div>7</div> <div>8</div> <div>6</div> <div>11</div> <div>16</div> <div>7</div> <div>13</div> <div>19</div> </div> </div> <div> <div> <div>○ CALIBRATED PENETROMETER TONS/FT²</div> <div> <div>×</div> PLASTIC LIMIT% <div>●</div> WATER CONTENT% <div>△</div> LIQUID LIMIT% </div> <div> <div>⊗ STANDARD PENETRATION BLOWS/FT</div> </div> </div> <div> THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.</div></div>											
 WL		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 05/29/18		CAVE IN DEPTH @ 16.1'					
 WL(SHW)		 WL(ACR) Dry		BORING COMPLETED 05/29/18		HAMMER TYPE Auto					
 WL				RIG CME 550 FOREMAN Dale Price		DRILLING METHOD HSA					

Test Location	Test Depth (ft)	Approximate Test Elevation (EL)	Soil Encountered at Test Depth	Field Infiltration Rate (in/hr)
I-1	4.84	435.5	Medium Dense GRAVELLY SILT (ML)	0.48
I-2	9.27	432.0	Medium Dense SILT with SAND (ML)	0.57
I-3	4.84	437.5	Medium Dense SANDY SILT (ML)	0.72
I-4	4.92	438.0	Firm LEAN CLAY (CL)	0.06
I-5	9.75	431.5	Medium Dense SILT (ML)	0.39

**Appendix B – Field Operations
Infiltration Test Results**
ECS Project No. 13:8624



Urbana Elementary School Replacement
3554 Urbana Pike
Urbana, Frederick County, Maryland

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

Plasticity Chart

Grain Size Analysis

Moisture-Density Relationship Curves

Page 1 of 1

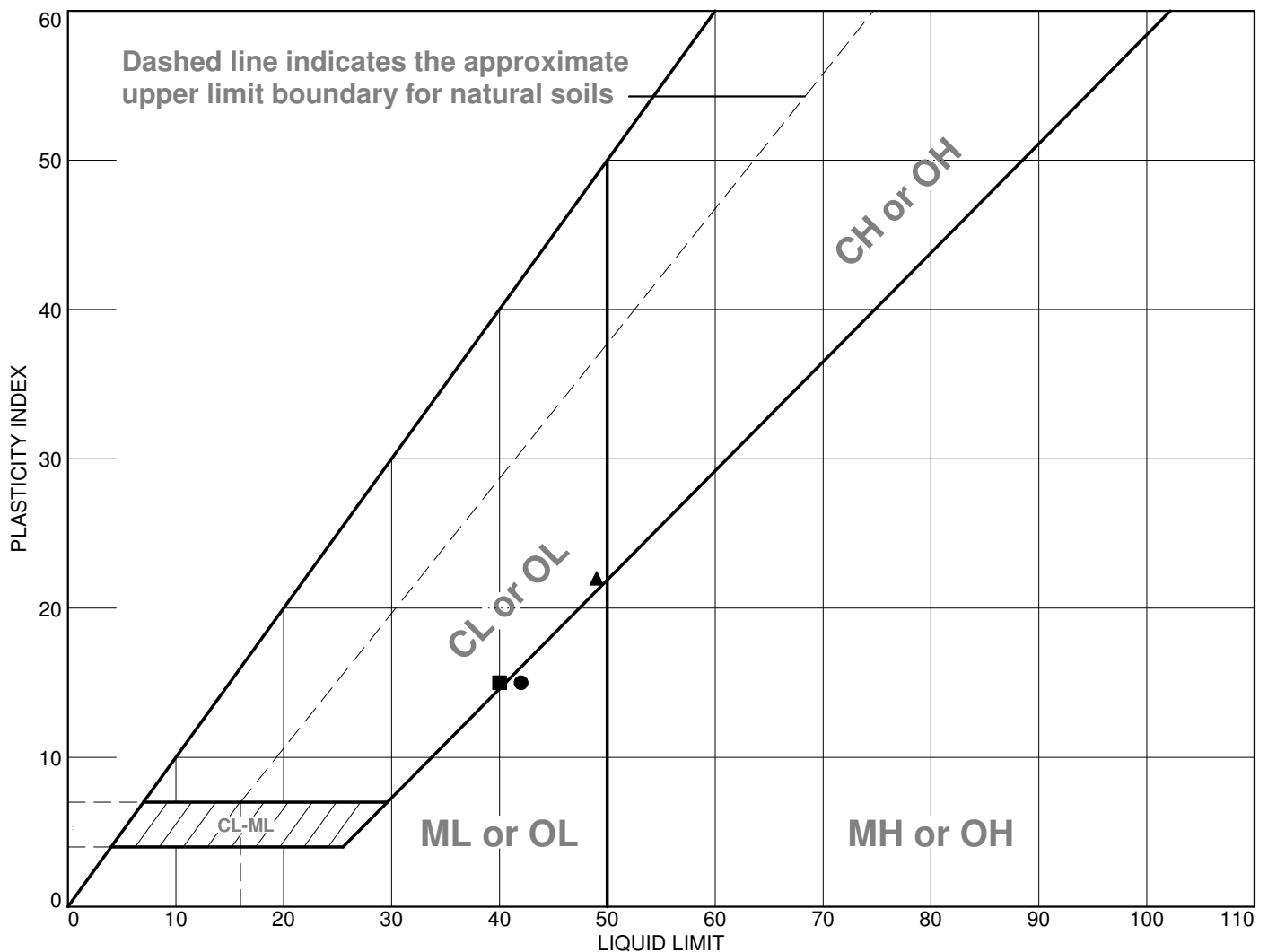
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Sandy SILT	42	27	15	78.7	64.9	ML
■	Brown Gravelly CLAY w/Sand	40	25	15	72.8	64.7	CL
▲	Orangish Brown CLAY w/Sand	49	27	22	88.4	76.3	CL

Project No. 8624

Client: Grimm & Parker

Project: Urbana Elementary School Replacement - Phase I

● Source of Sample: B-5 Depth: 1.00-2.50 Sample Number: S-1

■ Source of Sample: B-6 Depth: 3.50-5.00 Sample Number: S-2

▲ Source: RW-2 Depth: 2.00-5.00 Sample No.: BAG 2-5

Remarks:



ECS MID-ATLANTIC, LLC

5112 Pegasus Court, Suite S
Frederick, MD 21704

Phone: (301) 668-4303
Fax: (301) 668-3519

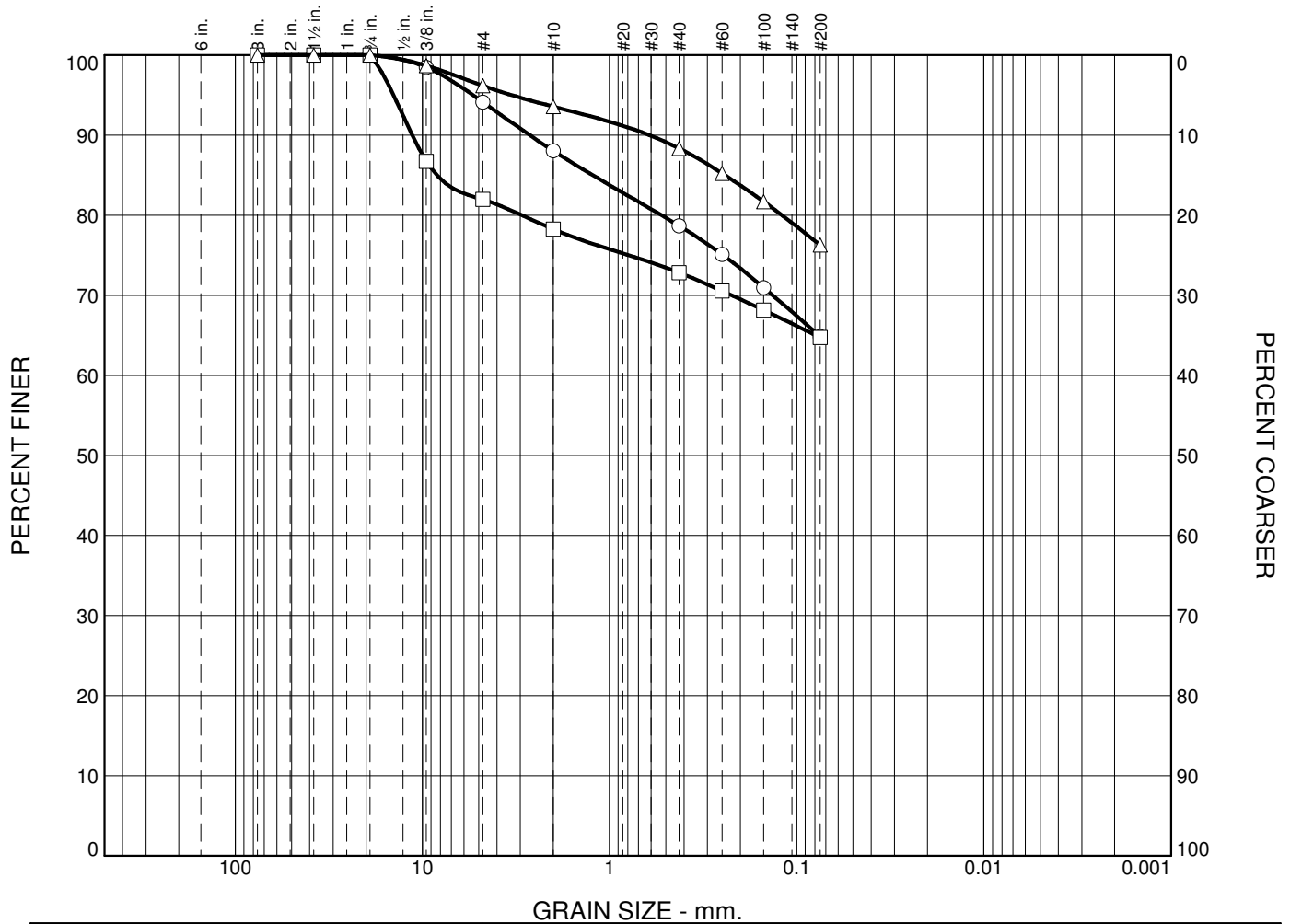
Figure

Tested By: PK

Checked By: PK

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	5.9	6.0	9.4	13.8	64.9	
□	0.0	0.0	18.0	3.7	5.5	8.1	64.7	
△	0.0	0.0	3.8	2.6	5.2	12.1	76.3	

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-5	S-1	1.00-2.50	Brown Sandy SILT	ML
□	B-6	S-2	3.50-5.00	Brown Gravelly CLAY w/Sand	CL
△	RW-2	BAG 2-5	2.00-5.00	Orangish Brown CLAY w/Sand	CL



ECS MID-ATLANTIC, LLC
5112 Pegasus Court, Suite S
Frederick, MD 21704
Phone: (301) 668-4303
Fax: (301) 668-3519

Client: Grimm & Parker

Project: Urbana Elementary School Replacement - Phase I

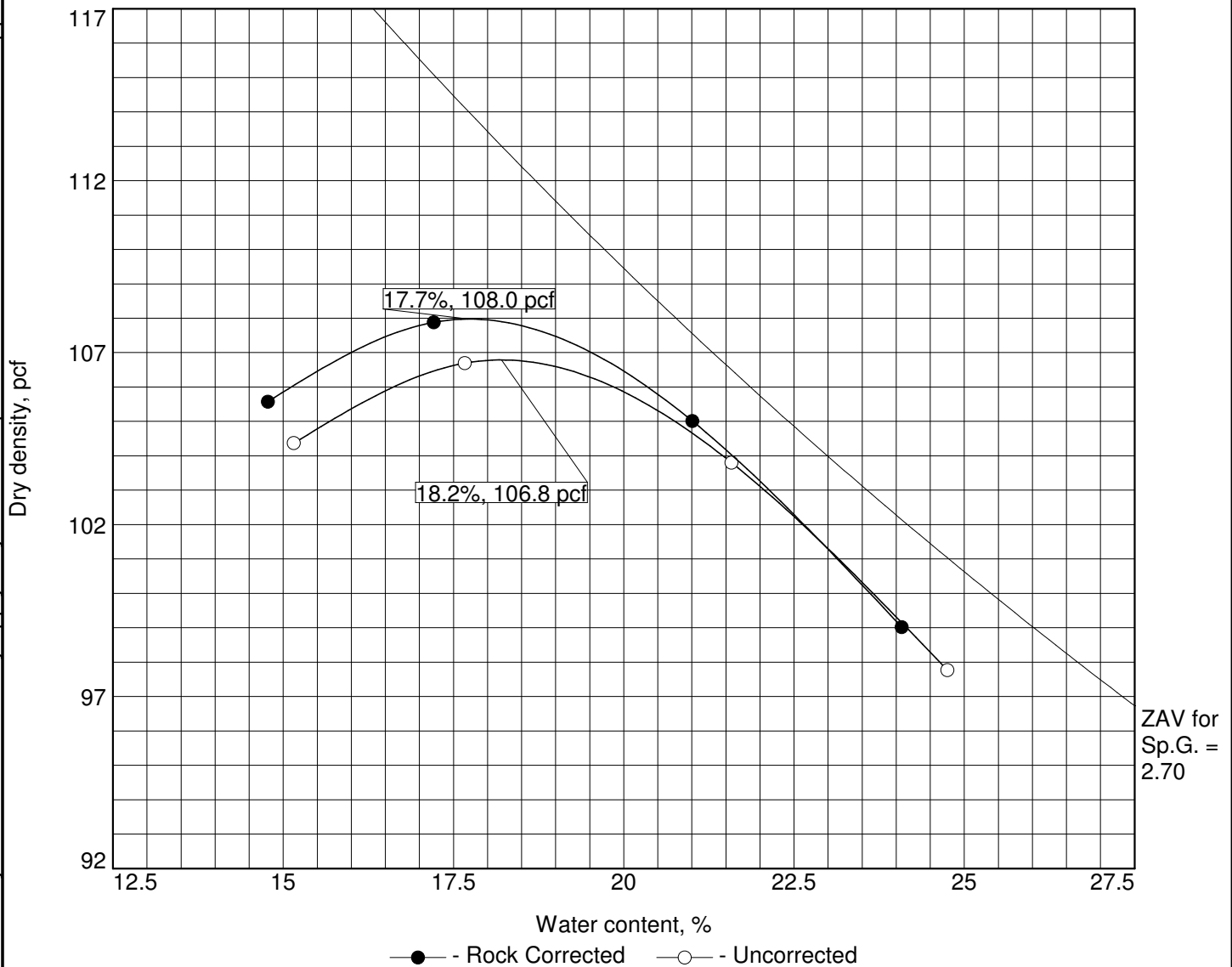
Project No.: 8624

Figure

Tested By: PK

Checked By: PK


COMPACTION TEST REPORT For Curve No. BAG 2-5



Test specification: ASTM D 698-12 Method A Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
2.00-5.00	CL	A-7-6(17)		2.7	49	22	3	76.3

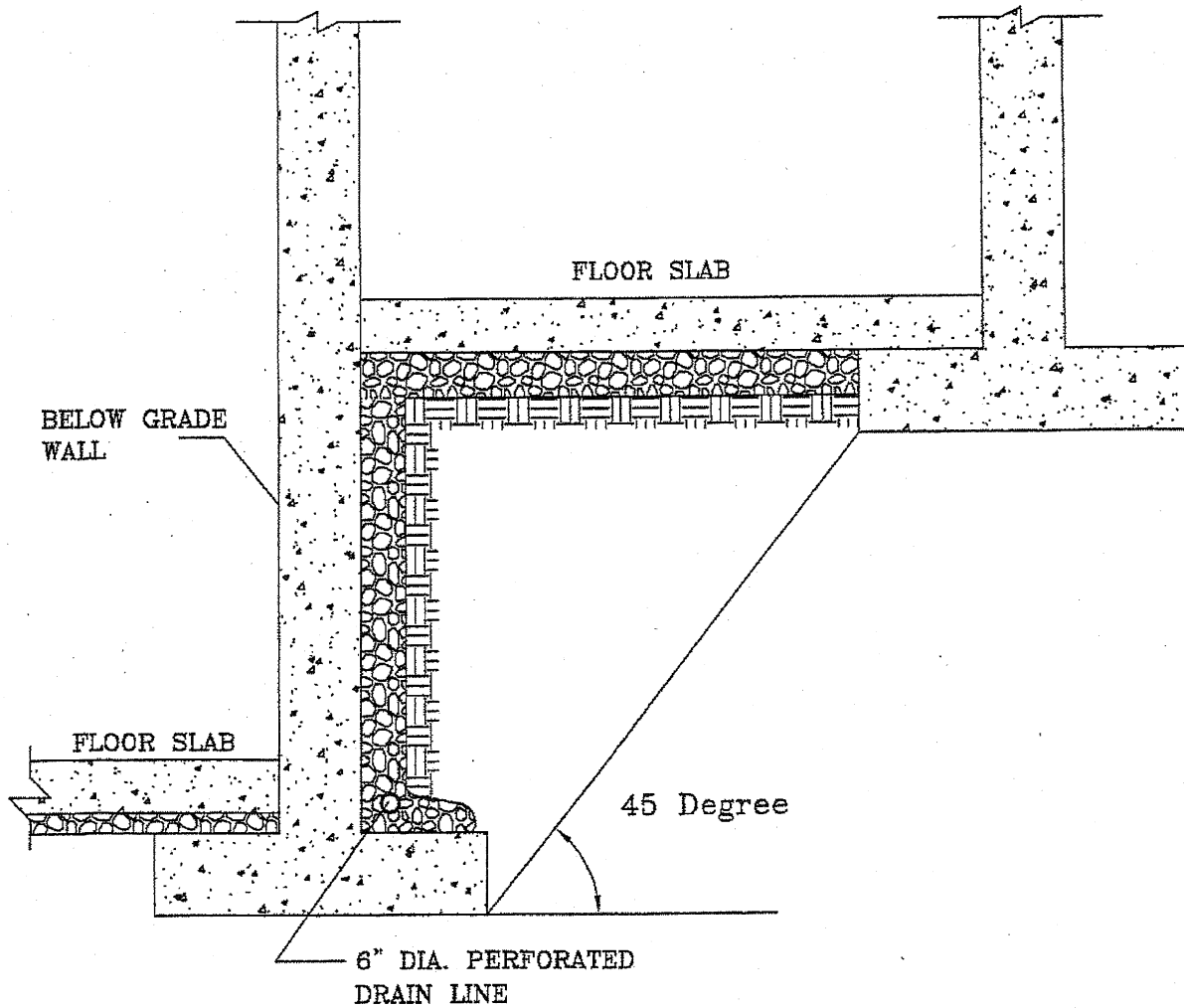
ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 108.0 pcf	106.8 pcf	Orangish Brown CLAY w/Sand
Optimum moisture = 17.7 %	18.2 %	

Project No. 8624		Client: Grimm & Parker	Remarks:
Project: Urbana Elementary School Replacement - Phase I			
		Date: 06/20/	
<input type="radio"/> Source of Sample: RW-2		Sample Number: BAG 2-5	
		ECS MID-ATLANTIC, LLC 5112 Pegasus Court, Suite S Frederick, MD 21704 Phone: (301) 668-4303 Fax: (301) 668-3519	Figure

Tested By: PK Checked By: PK

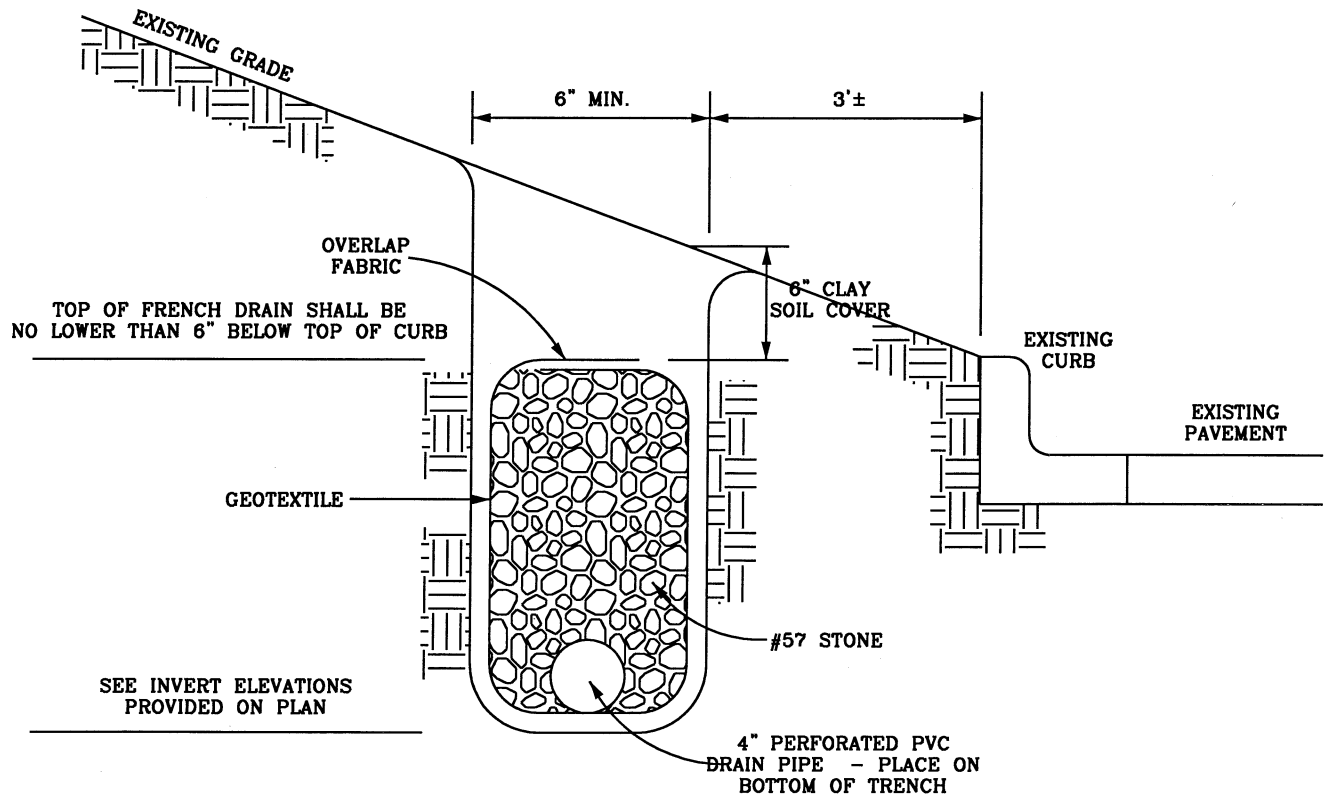
APPENDIX D – Supplemental Report Documents

Zone of Influence Diagram
French Drain Installation Procedure



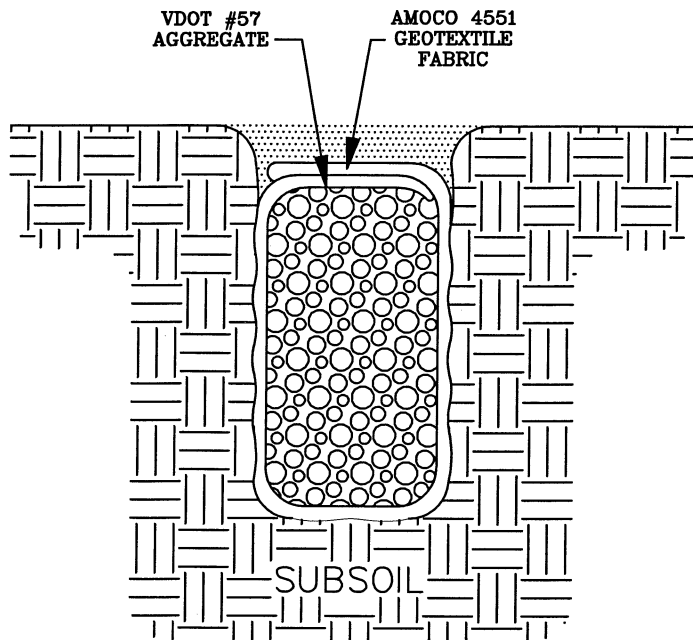
NOTE: HYDRAULICALLY CONNECT UPPER WALL DRAIN AND UNDERSLAB GRAVEL TO LOWER FLOOR SLAB GRAVEL AND DRAIN AS SHOWN.

ZONE OF INFLUENCE DIAGRAM



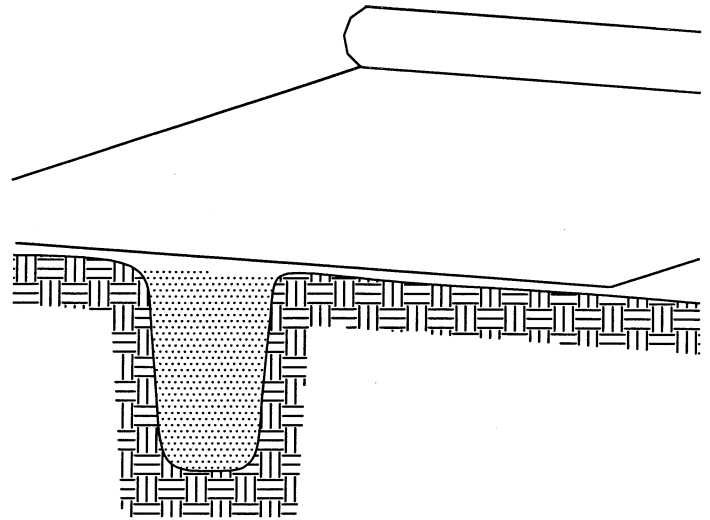
FRENCH DRAIN SHALLOW TRENCH

FINAL CONFIGURATION



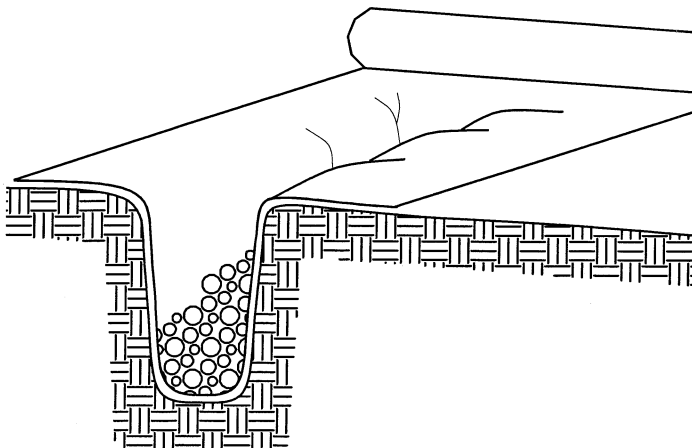
SUBDRAIN USING FILTER FABRIC

STEP 1



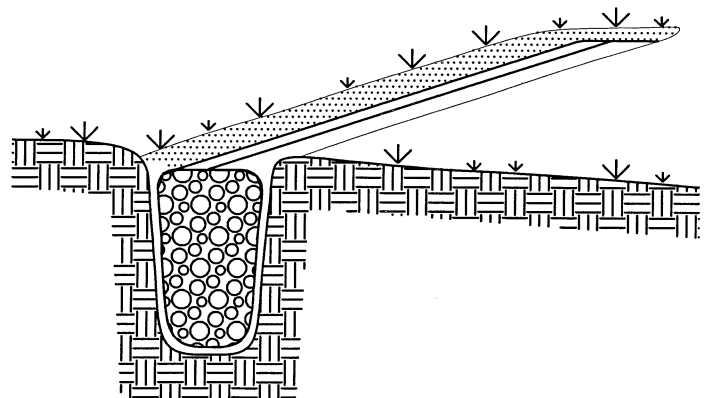
FABRIC IS UNROLLED DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED AND COVERED WITH BASE STONE

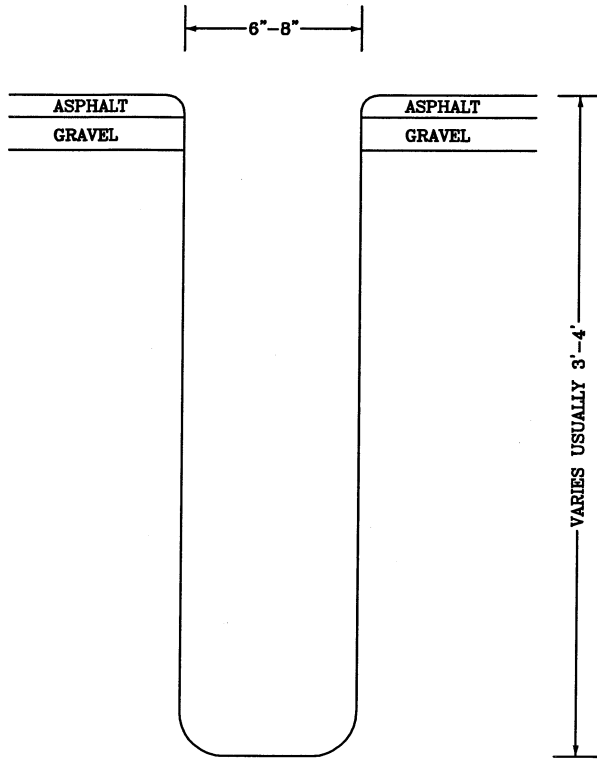


14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA. 22151
703/471-8400
FAX/834-5527

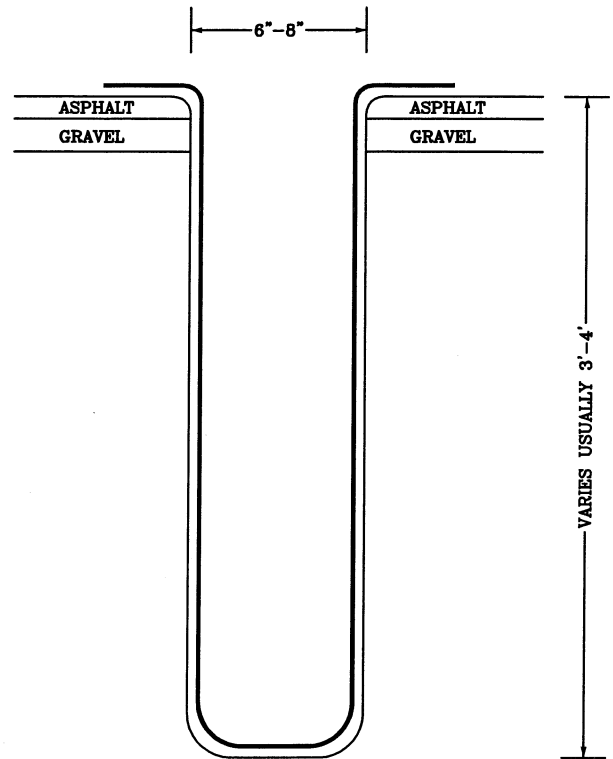
FRENCH DRAIN ©
INSTALLATION PROCEDURE



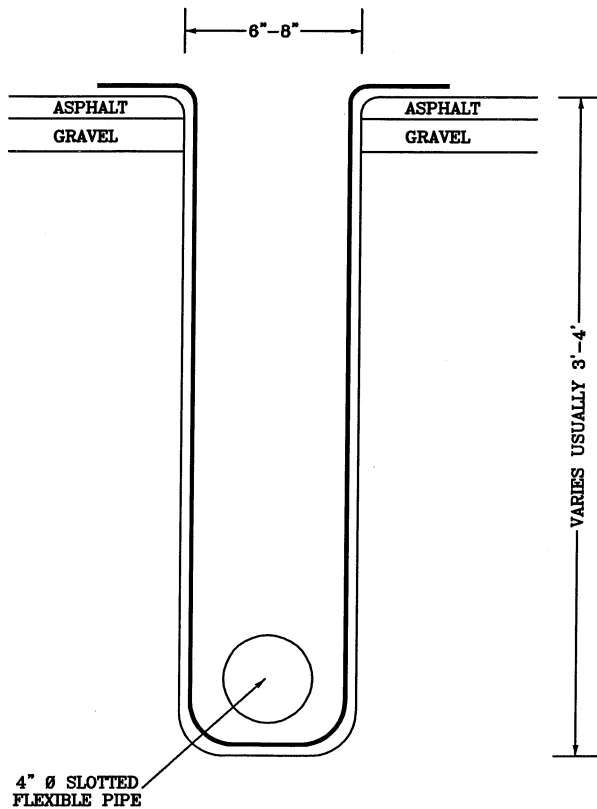
FRENCH DRAIN INSTALLATION DIAGRAM



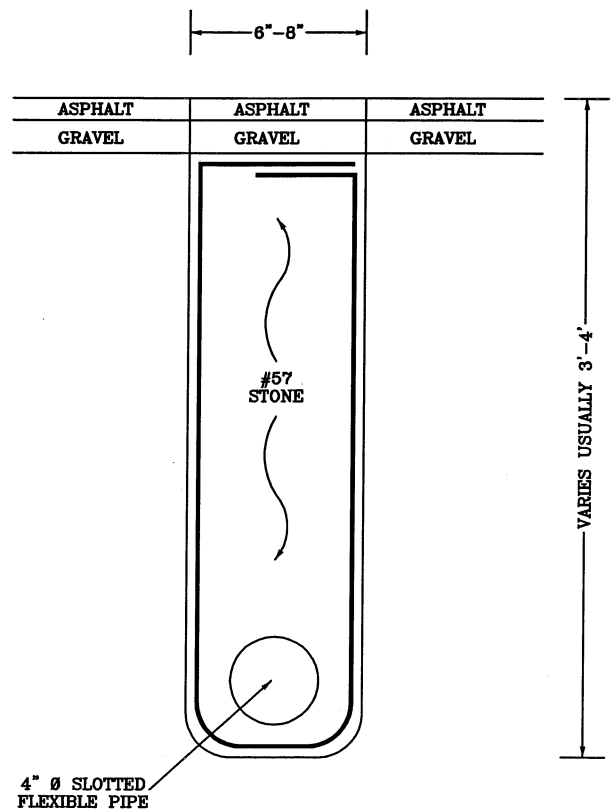
CUT ASPHALT - EXCAVATE TRENCH



LINE TRENCH WITH FILTER FABRIC

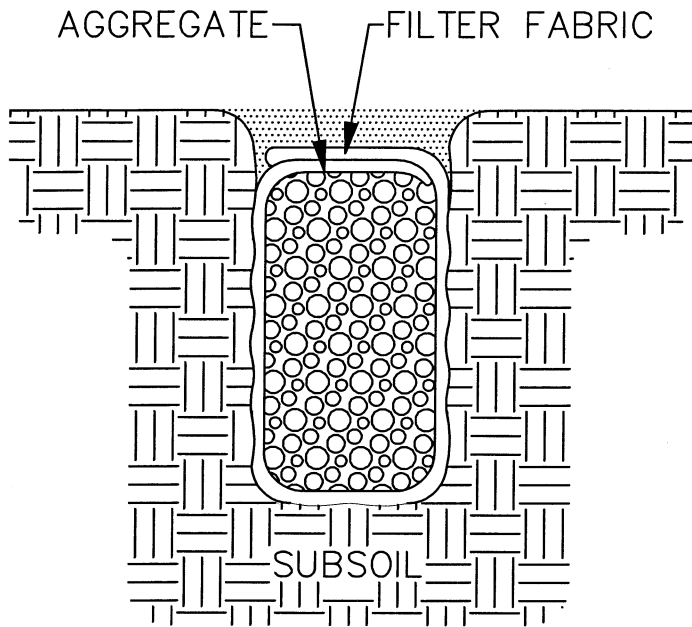


INSERT SLOTTED PIPE/GRAVEL



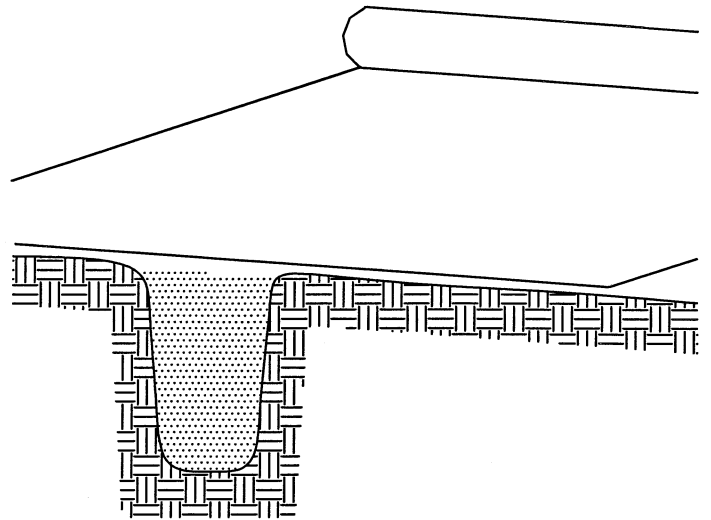
LAP FILTER CLOTH/PATCH ASPHALT

FINAL CONFIGURATION



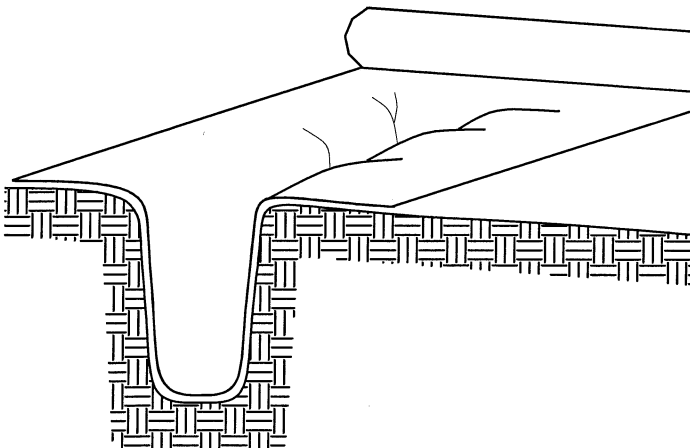
SUBDRAIN USING FILTER FABRIC

STEP 1



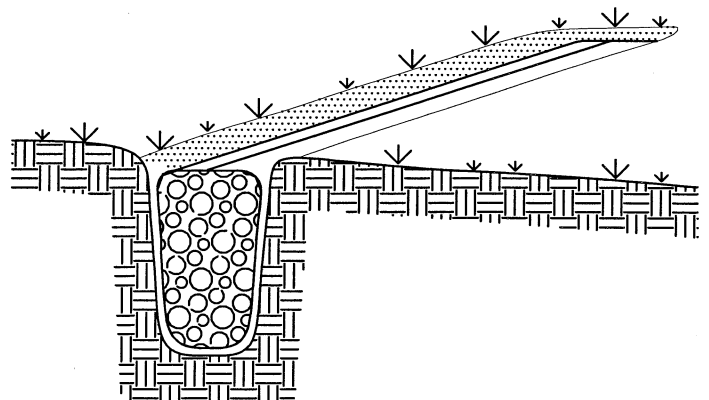
FABRIC IS UNROLLED
DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED
WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED
AND COVERED WITH SOIL

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

1.2 RELATED REQUIREMENTS

- A. Section 05 12 00 - Structural Steel: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.3 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- D. ACI 347R - Guide to Formwork for Concrete; 2014.
- E. ASME A17.1 - Safety Code for Elevators and Escalators; 2013.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on void form materials .
- C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
 - 1. Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork; stamped and signed by engineer registered in the State of Maryland.
 - 2. Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
 - 3. Indicate location of all slab joint types.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 347, ACI 301, and ACI 318.
 - 1. Maintain one copy of standards on project site.

PART 2 PRODUCTS**2.1 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

D. Comply with relevant portions of ACI 347, ACI 301, and ACI 318.

2.2 FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

2.3 PREFABRICATED FORMS

A. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick. .

2.4 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, 1 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
- C. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.
- D. Corners: Chamfered, rigid plastic or wood strip type; 3/4 x 3/4 inch size; maximum possible lengths.
- E. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- F. Flashing Reglets: Galvanized steel, 22 gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- H. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.
- I. Waterstops: Preformed mineral colloid strips, 3/4 inch thick, moisture expanding.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Provide chamfer strips on external corners of beams, joists, and columns.

- D. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.
- E. Coordinate this section with other sections of work that require attachment of components to formwork.
- F. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.4 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless more stringent tolerances are required within the Contract Documents.
- B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.8 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.

- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- C. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.
- D. Temporary formwork must be completely removed at all slab-on-grade locations prior to subsequent pours.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.2 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- C. ACI SP-66 - ACI Detailing Manual; 2004.
- D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2006 (Reapproved 2011).
- E. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- G. CRSI (DA4) - Manual of Standard Practice; 2009.
- H. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel reinforcement: Industry-wide or product-specific EPD.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For steel having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For steel having regionally sourced recycled material: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.4 QUALITY ASSURANCE

- A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, ACI SP-66, ACI 318, and ASTM A 184/A 184M.
 - 1. Maintain one copy of each document on project site.
- B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

- C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
 - 3. Recycled Content: Provide steel with minimum 90 percent total recycled content, including at least 60 percent post-consumer recycled content.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed (weldable reinforcing steel).
- C. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
 - 1. Flat Sheets.
 - 2. Mesh Size and Wire Gage: As indicated on drawings.
- D. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.2 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is not permitted unless otherwise noted on the drawings. Where indicated on the drawings that welding of reinforcing bar is required, the reinforcing steel shall comply with ASTM A706..
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 - 1. Review locations of splices with Architect.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Conform to structural drawings for concrete cover over reinforcement.

3.2 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 40 00, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Concrete for composite floor construction.
- B. Floors and slabs on grade.
- C. Concrete foundation walls and building walls.
- D. Footings.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads.
- G. Fill for steel pan stairs.

1.2 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 03 39 00 - Concrete Curing.
- D. Section 07 95 13 - Expansion Joint Cover Assemblies.
- E. Section 07 90 05 - Joint Sealers.

1.3 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; 1998 (Reapproved 2004).
- C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- F. ACI 305R - Hot Weather Concreting; 2010.
- G. ACI 306R - Cold Weather Concreting; 2010.
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.
- M. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- O. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2014.

- P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- R. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.
- S. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- T. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.
- U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Samples: Submit samples of underslab vapor retarder to be used.
- D. Test Reports: Submit report for each test or series of tests specified.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For cement, slag: Industry-wide or product-specific EPD.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For products having recycled content (GGFB, pozzolans): 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 (GGFB, pozzolans): Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For admixtures and coatings, if applicable: 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 v1.1-2010 and printed statement of VOC content in g/L. Include volume of material applied per product.
- F. Design Mixtures:
 - 1. Submit for each concrete mixture.
 - 2. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 3. Indicate amounts of mixing water to be withheld for later addition at Project site.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.

- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.1 FORMWORK

- A. Comply with requirements of Section 03 10 00.

2.2 REINFORCEMENT

- A. Comply with requirements of Section 03 20 00.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal Portland type.
 - 1. Acquire all cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33.
 - 1. Acquire all aggregates for entire project from same source.
- C. Lightweight Aggregate: ASTM C 330.
- D. Fly Ash: Not permitted.
- E. Ground Granulated Blast-Furnace Slag (GGFB): ASTM C 989, Grade 100 or 120.
- F. Calcined Pozzolan: ASTM C618, Class N.
- G. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- H. Water: Clean and not detrimental to concrete.
- I. Refer to Section 03 35 19 for special aggregate and pigment required at ground and polished concrete floor slabs.

2.4 CHEMICAL ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Product complying with ASTM E 1745, Class A.
 - 1. Maximum Permeance ASTM E96: 0.018 perms (English).
 - 2. Provide standard accessories and tape for complete system.
 - 3. Acceptable Products:
 - a. Stego Wrap (15-mil) Vapor Barrier by STEGO INDUSTRIES LLC.
 - b. Perminator 15 mils by W.R. Meadows, Inc.
 - c. 15 Mil Green by Reef Industries, Inc.

- d. Vapor Block 15 by Raven Industries.
 - e. Barrier-Bac VB-350, by Interplast Group.
- 4. Single ply polyethylene is prohibited.
- B. Non-Shrink Cementitious Grout: ASTM C 1107/C 1107M; Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
 - 2. Minimum Compressive Strength at 28 Days: 7,000 psi.
- C. Curing Materials: Comply with requirements of Section 03 39 00.

2.6 BONDING AND JOINTING PRODUCTS

- A. Epoxy Bonding System: Complying with ASTM C881/C881M and of Type required for specific application.
- B. Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.
 - 1. Additive Manufacturers:
 - a. Aquafin, Inc: www.aquafin.net/#sle.
 - b. Xypex Chemical Corporation: www.xypex.com/#sle.
 - c. Kryton International Inc.; www.kryton.com.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
- D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
 - 1. Available Products:
 - a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - b. Con Seal CS-231; Concrete Sealants Inc.
 - c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - d. Hydrotite; Greenstreak.
 - e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
 - f. Adeka Ultra Seal; Mitsubishi International Corporation.
 - g. Superstop; Progress Unlimited Inc.
- E. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard, cork or flexible foam, complying with ASTM D 1751, thickness as indicated on drawings and full depth of slab less 1/2 inch; tongue and groove profile.
- F. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
 - 1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
 - 2. Height: To suit slab thickness.

2.7 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 - 1. Replace no less than 30% and no more than 40% of Portland cement in structural concrete with approved pozzolanic materials.
 - 2. Do not exceed 25% total pozzolans in finished slabs.
 - 3. GGBS Content: not to exceed 35% of total cementitious material.
 - 4. Silica Fume Content: not to exceed 10% of total cementitious material.

5. Obtain approval in advance before submitting mix containing any other pozzolanic substances.
- B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
 1. Replace no less than 30% and no more than 40% of Portland cement in structural concrete with approved pozzolanic materials.
 2. Do not exceed 25% total pozzolans in finished slabs.
 3. GGBS Content: not to exceed 35% of total cementitious material.
 4. Silica Fume Content: not to exceed 10% of total cementitious material.
 5. Obtain approval in advance before submitting mix containing any other pozzolanic substances.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- E. Normal Weight Concrete:
 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 2. Fly Ash Content: Not permitted.
 3. Water-Cement Ratio: Maximum 58 percent by weight.
 4. Do not air entrain concrete to trowel-finished interior floors and suspended slabs; do not allow entrapped air content to exceed 3 percent.
 5. Air Content (Exterior exposed concrete only): Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
 - a. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
 6. Maximum Slump: 4 inches.
 7. Maximum Aggregate Size: 3/4 inch.
- F. Structural Lightweight Concrete:
 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 2. Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.
 3. Maximum Slump: 3 inches.
 4. Maximum Aggregate Size: 5/8 inch.
 5. Maximum dry unit weight: 115 lb per cubic foot.

2.8 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Do not add water to concrete during delivery, at the project site or during placement except as predetermined by concrete mix, unless approved by the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

- A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
- B. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout in accordance with manufacturer's instructions.
- D. Install vapor retarder under interior slabs on grade in accordance with manufacturer's instructions and ASTM E 1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the concrete placement whenever possible.
 - 2. Extend vapor barrier to the foundation wall and turn up vertically to terminate at the top of the slab. Vapor barrier to be installed behind the isolation joint material and sealed to the masonry or concrete. Where obstructed by impediments, such as dowels, seal penetrations using manufacturer's textured seal tape per manufacturer's instructions. Ensure the masonry or concrete substrate is clean and dry prior to adhering tape.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Apply seam tape to a clean and dry vapor barrier.
 - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 6. Avoid the use of non-permanent stakes driven through vapor barrier.
 - 7. If non-permanent stakes are driven through vapor barrier, repair as recommended by vapor barrier manufacturer.
 - 8. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.4 SLAB JOINTING

- A. Anchor joint fillers and devices to prevent movement during concrete placement.
- B. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- C. Separate slabs on grade from vertical surfaces with joint filler.
- D. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

- E. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 90 05 for finish joint sealer requirements.
- F. Install joint devices in accordance with manufacturer's instructions.
- G. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- H. Install joint device anchors for expansion joint assemblies specified in Section 07 95 13. Maintain correct position to allow joint cover to be flush with floor and wall finish.
- I. Apply sealants in joint devices in accordance with Section 07 90 05.
- J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- K. Place concrete continuously between predetermined expansion, control, and construction joints.
- L. Do not interrupt successive placement; do not permit cold joints to occur.
- M. Place floor slabs in strip pouring or saw cut pattern indicated.
- N. Saw cut joints within 2 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

3.5 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Concrete Slabs: Finish to requirements of Section 03 35 13.

3.6 CURING AND PROTECTION

- A. Comply with requirements of Section 03 39 00.

3.7 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Provide free access to concrete operations at project site and cooperate with appointed firm; inspection to occur for:
 - 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. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- E. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- F. Compressive Strength Tests: ASTM C 39/C 39M.
 - 1. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure five standard cylinder specimens for each composite sample - fifth cylinder will be held in reserve.
 - 2. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - 3. Obtain test samples for every 50 cu yd or less of each class of concrete placed.
 - 4. A compressive-strength test shall be the average compressive strength from all specimens obtained from same composite sample and tested at age indicated.
 - 5. 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.
- G. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- H. Perform one slump test, at point of discharge for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.
- I. Perform unit weight test of structural lightweight concrete for each set of test cylinders taken, following procedures of ASTM C567.
- J. Test concrete temperature each hour when air temperature is 40 degrees F and below and when 80 degrees F and above, and for each set of test cylinders taken, following procedures of ASTM C1064/C1064M.

3.8 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
 - 1. Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.
 - 2. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 - 3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

END OF SECTION

SECTION 03 35 13 - CONCRETE FLOOR FINISHING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Finishing slabs on grade and monolithic floor slabs.
- B. Surface treatment with concrete hardener and sealer.

1.2 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- C. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For vapor barrier, admixtures and coatings, if applicable: Material Ingredient Report
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and printed statement of VOC content in g/L. Include volume of material applied per product.
- C. Submit floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- D. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
 - 1. Maintain one copy on project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.6 PROJECT CONDITIONS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperature of 50 degrees F minimum.
- B. Provide ventilation sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Concrete Floor Finishes:
 - 1. Dayton Superior Corporation: www.daytonsuperior.com.

2. L&M Construction Chemicals, Inc: www.lmcc.com.
3. BASF Construction Chemicals-Building Systems: www.chemrex.com.

2.2 COMPOUNDS - HARDENERS AND SEALERS

- A. Chemical Hardener: Clear, chemically reactive, waterborne solution of inorganic silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 1. Provide for interior slabs not receiving a subsequent finish (remaining exposed concrete); regardless of the Finish Schedule indicating concrete hardener or not.
 2. Interior wet-applied coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
 3. Products:
 - a. Ashford Formula, Concrete Chemical Company, Inc.
 - b. Seal Hard, L & M Construction Chemicals, Inc.
 - c. Titan Hard, Burke Construction Chemicals.

PART 3 EXECUTION

3.1 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.
- B. Steel trowel surfaces that will receive carpeting, resilient flooring, seamless flooring, thin set terrazzo, or thin set ceramic tile.
- C. Steel trowel surfaces that are scheduled to be exposed.

3.2 FLOOR SURFACE TREATMENT

- A. Apply hardener to floor surfaces in accordance with manufacturer's instructions.

3.3 TOLERANCES

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for flatness.
- B. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
 1. Exposed to View and Foot Traffic: Ff 20 and Fl 15.
 2. Slabs to be Covered with Thin Floor Coverings (ie., resilient flooring): 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.
 3. Slabs to be Covered with Wood Athletic Flooring: 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.
 4. Slabs to be Covered with Carpet and Other Slabs: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 20; with minimum values of flatness, F(F) 17; and of levelness, F(L) 15.
 5. The F(L) values listed above are not applicable to elevated slab on deck. Only F(F) values apply to elevated slabs.
- D. Correct the slab surface if tolerances are less than specified.

- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

END OF SECTION

SECTION 03 39 00 - CONCRETE CURING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Initial and final curing of horizontal and vertical concrete surfaces.

1.2 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
- C. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
- D. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- E. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- F. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

1.3 SUBMITTALS

- A. Product Data: Provide data on curing compounds, moisture-retaining sheet, and polyethylene film, including compatibility of different products and limitations.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For concrete curing compounds, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For concrete curing compound, if available: Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied concrete curing compound: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and printed statement of VOC content in g/L. Include volume of material applied per product.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1R.

PART 2 PRODUCTS**2.1 MATERIALS**

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Membrane Curing Compound: ASTM C309 Type 1 - Clear or translucent, Class B.
 - 1. Interior wet-applied concrete curing compounds: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- C. Moisture-Retaining Sheet: ASTM C171.
 - 1. Curing paper, regular.
 - 2. Polyethylene film, clear, minimum nominal thickness of 0.0040 in..
 - 3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd, 40 inches wide.

- D. Polyethylene Film: ASTM D2103, 4 mil thick, clear.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION - HORIZONTAL SURFACES

- A. Cure floor surfaces in accordance with ACI 308R.
- B. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306 for cold-weather protection and ACI 305 for hot-weather protection during curing.
- C. 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.
- D. Cure floor surfaces in accordance with ACI 308.
- E. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges; maintain in place for not less than 4 days.
- F. Absorptive Moisture-Retaining Sheet: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.
- G. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in one coat.

3.3 EXECUTION - VERTICAL SURFACES

- A. Cure surfaces in accordance with ACI 308R.
- B. Cure surfaces in accordance with ACI 308.
- C. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions in one coat.

3.4 PROTECTION

- A. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Concrete Block.
- B. Concrete Brick.
- C. Clay Facing Brick.
- D. Mortar and Grout.
- E. Reinforcement and Anchorage.
- F. Flashings.
- G. Lintels.
- H. Accessories.

1.2 REFERENCE STANDARDS

- A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
- B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- F. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2017.
- G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2017a.
- I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.
- K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- N. ASTM C476 - Standard Specification for Grout for Masonry; 2016.
- O. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.
- P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- Q. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples for Verification: For each type and color of the following:
 - 1. Face brick, in the form of straps of five or more bricks.
 - 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Shop Drawings:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.Fabricated
 - 2. Flashing: Detail inside/outside corner units, sill and head conditions; end-dam conditions; base-of-wall, lintel and low roof-to-wall conditions; and other special applications.
- F. Mix Designs: For each type of mortar and grout.
 - 1. Include description of type and proportions of ingredients.
 - 2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For cement and steel reinforcement: Industry-wide or product-specific EPD.
 - 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.
- H. Coordinate with Construction Waste Management requirements.
- I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- J. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot-weather requirements.
- K. Temporary Bracing Plan:
 - 1. Provide a temporary bracing plan for the information-only of the Architect; plan to be submitted minimum two weeks prior to initiating masonry Work.
 - 2. The bracing plan must be based on the Mason Contractors Association of America's Standard Practice for Bracing Masonry Walls Under Construction, and Masonry Wall Bracing Design Handbook, or another industry recognized standard.
 - 3. Bracing plan must be reviewed by a Professional Structural Engineer licensed in the State of Maryland; Professional Structural Engineer to provide a letter certifying his review of the plan and acknowledgement of its completeness.

4. The bracing plan and Professional Structural Engineer's letter must indicate project conditions unique to any referenced standard and provide for the unique bracing required for those conditions.
5. Maintain one copy of any industry standard referenced within the plan, on project site.

1.4 QUALITY ASSURANCE

- A. Masonry Contractor Qualification:
 1. Engage a trade contractor with at least 10 years experience in masonry construction of type and scope included in the construction documents.
 2. Demonstrate experience by submitting to the Owner a list of at least 10 masonry projects of similar size, complexity and scope.
 3. Submit resumes of all key personnel that will be assigned to the Project; dedicate assigned personnel to the Project for the entire scope of Work.
- B. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
 1. Maintain one copy of each document on project site.
- C. Fire-Resistance Ratings: Where indicated, provide materials identical to those assemblies with fire-resistance ratings conforming to the Standard Method for Determining Fire Resistance of Concrete and Masonry Assemblies, ACI 216.1-97/TMS-0216-07, National Concrete Masonry Association TEK 7-1A, and ASTM E-119, and acceptable to authorities having jurisdiction.
 1. Certification of concrete masonry units for fire ratings must be provided by the National Concrete Masonry Association or qualified independent testing agency.
 2. Provide Letter of Certification for aggregates used in mix design assuring compliance with ASTM C 33 and ASTM C 331.
 3. Provide mix design and determined equivalent thickness, for units incorporating recycled content materials.

1.5 MOCK-UP

- A. Mock-up: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials for final unit of Work.
 1. Locate mockup on site within 4 weeks of Contract award in location as directed.
 2. List of Material Used in Construction Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to specifically identify exact materials used. Include mix proportions for mortar and grout and source of aggregates.
 3. Build mockup of typical wall.
 - a. Include exterior face brick wall with cast stone trim; manufactured stone cladding with trim.
 - b. Include window complying with requirements of Division 8 Section "Aluminum Windows" with applicable window lintel detail.
 - c. Seal perimeter of window complying with requirements of Division 7 Section "Joint Sealers."
 - d. Include sealant-filled control joints complying with requirements of Division 7 Section "Joint Sealers."
 4. Build mockup as indicated on Drawings.

5. Notify the Architect when mock-up is ready for inspection. Remove and replace defective and deficient parts of the wall as identified by the Architect, and replace until such time that all the work is acceptable to the Architect and Owner.
6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
 - c. When directed, demolish and remove mockups from Project site.

1.6 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

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.

1.8 ENVIRONMENTAL REQUIREMENTS

- 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. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
 3. Verify masonry protection at end of each day; inadequate protection by the trade contractor to be corrected or replaced by the Contractor, for proper protection; costs incurred by the Contractor is not the Owner's responsibility, but may be recovered under agreement with trade contractor.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. 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.
- D. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Special Shapes:
 - a. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - b. Provide bullnose units for outside corners, unless otherwise indicated.
 - c. Bullnose units are not to be used at areas scheduled to be covered with tile.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - 4. Recycled Content: Provide CMU with at least 40 percent fly ash.
 - 5. Regional Materials: Provide CMU manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- B. Decorative Block:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Type: Ground face.
 - a. Include heat treated clear acrylic coating for interior units.
 - 3. Special Shapes: Provide non-standard blocks configured for corners.
 - 4. Producers:
 - a. Trenwyth Industries, an Oldcastle Company.
 - b. Nitterhouse Masonry Products, LLC.
 - c. EP Henry Corporation.
 - d. York Building Products Company, Inc.
 - e. New Holland Concrete.
 - f. Frederick Block.
 - 5. Shall meet ASTM C90 for solid load-bearing concrete masonry units and ASTM C55.
 - 6. Units shall be free of cracks, chips and other defects; no broken corners will be permitted.
 - 7. Produce exterior units with integral water-repellant conforming to:
 - a. CMU producer shall be qualified by manufacturer of integral liquid polymeric CMU water-repellent.
 - b. Warranty:
 - 1) Integral liquid polymeric CMU water-repellent shall be warranted by admixture manufacturer to be free of defects and to meet manufacturer's published physical and chemical properties.
 - 2) CMU producer shall warrant that integral polymeric CMU water-repellent has been provided at an appropriate dosage rate in decorative block units shipped to this Project for use in exterior walls.
 - 3) Installer shall warrant that decorative CMUs containing integral polymeric CMU water-repellent have been placed in exterior walls.
 - c. Description: Integral liquid polymeric admixture, mixed with concrete during production of decorative CMUs, capable of attaining Class E Rating under ASTM E514, and no decrease in flexural strength or compressive strength of prisms when compared to "control", under ASTM E72.

- d. Project Standard: Dry-Block Integral Liquid Polymeric CMU Water-repellent admixture manufactured by Grace Construction Products.
- 8. Color shall be uniform; to be selected from all available colors offered by manufacturer.

2.2 BRICK UNITS

A. Manufacturers:

- 1. Selections - Basis-of-Design:
 - a. Color 1: Provide one of the following:
 - 1) Iron Spots/Frits Chelsea KT Type 7 Modular by Watsontown Brick Company.
 - 2) 4-Way Blend, Iron Spot, Wire-Cut, Modular by Taylor Clay Products, Inc.
 - b. Color 2: Provide one of the following:
 - 1) Cobalt Blue (G11-9203) by Glen Gery.
 - 2) #2200A Cobalt by Elgin Butler.

B. Facing Brick: ASTM C 216, Type FBS, Grade SW.

- 1. Size: Modular.
- 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample.

B. Packaged blend of portland cement complying with ASTM C 150, Type II/I or Type III, and hydrated lime.

- 1. Not more than 0.60 percent alkali.
- 2. Hydrated Lime: ASTM C207, Type S.
- 3. Mortar Aggregate: ASTM C144.
- 4. Grout Aggregate: ASTM C404.

C. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979.

- 1. Color(s): To Be Determined.
- 2. Manufacturers:
 - a. Davis Colors: www.daviscolors.com/#sle.
 - b. Lambert Corporation: www.lambertusa.com/#sle.
 - c. Solomon Colors: www.solomoncolors.com/#sle.
 - d. ESSROC Cement Corp.; Flamingo.
 - e. Lehigh Cement Company.

D. Admixtures: Permitted for cold- and hot-weather masonry work as permitted by referenced standards; non-chloride types.

E. Water: Clean and potable.

2.4 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:

- 1. AA Wire Products Co.
- 2. Dur-O-Wal: www.dur-o-wal.com.
- 3. Heckman Building Products, Inc.
- 4. Hohmann & Barnard, Inc (including Dur-O-Wal brand): www.h-b.com.
- 5. WIRE-BOND: www.wirebond.com/#sle.
- 6. National Wire Products Industries.

- B. Reinforcing Steel: ASTM A615/A615M Grade 60 (420) deformed billet bars; uncoated.
- C. Joint Reinforcement - General:
 - 1. Provide in lengths of not less than 10 feet.
 - 2. Provide with prefabricated corner and tee units of same design type, wire thickness and finish as adjoining joint reinforcement.
 - 3. Recycled Content: Provide steel with minimum 75 percent total recycled content, including at least 60 percent post-consumer recycled content.
- D. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- E. Multiple Wythe Joint Reinforcement: Ladder type; fabricated with moisture drip; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- F. Adjustable Multiple Wythe Joint Reinforcement: Ladder type with adjustable ties or tabs spaced at 16 in on center and fabricated with moisture drip; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 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 more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.
 - 1. Vertical adjustment: Not less than 2 inches.
- G. Ashlar Stone Veneer (Section 04 73 23) Anchor System for Joint Reinforcement: Similar to Hohman & Barnard, Inc. Tie-HVR, Wire-Bond Stone Tab Ladder or equal; provide as required by pattern or instead of individual veneer ties.
- H. Strap Anchors: Bent steel shapes configured as required for specific situations, 1-1/4 in width, 0.105 in thick, lengths as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face, corrugated for embedment in masonry joint, hot dip galvanized to ASTM A 153/A 153M, Class B.
- I. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
 - 1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- J. 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 more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.
 - 1. Fabricate to locate eyes 3 inches from face of masonry when installed.
- K. Masonry Veneer Anchors: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - 1. Anchor plates: Designed for fastening to structural backup through sheathing by two fasteners.

- a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 - b. Fabricate sheet metal anchor sections and other sheet metal parts from minimum 14 gage, steel sheet, galvanized after fabrication.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.
4. Products:
 - a. Hohmann & Barnard, Inc.; SBRA Anchor.
 - b. Construction Tie Products; CTP Veneer Anchoring System.
5. Organic-Polymer-Coated, Steel Drill Screws:
 - a. Dril-Flex; Elco Industries, Inc.
 - b. Traxx; ITW-Buildex.
- L. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches unless otherwise indicated.
 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- M. Reinforcing Bar Positioners:
 1. Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells, or as indicated on Drawings. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated. Provide units at all reinforced walls.
 2. Products:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.5 FLASHINGS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
 2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall flashing with drip edge, unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 4. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 5. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Application: Unless otherwise indicated, use the following:
 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.

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4. Where flashing is fully concealed, use metal flashing.
- C. Flexible Flashing:
1. Flexible Stainless Steel:
 - a. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics, except as modified below, are acceptable for use, subject to compliance with specified requirements:
 - 1) York Manufacturing, Inc.; Multi-Flash SS (Basis-of-Design)
 - 2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing
 - 3) Prosoco, Inc.; R-Guard SS ThruWall
 - 4) STS Coatings, Inc.; Gorilla Flash Stainless Fabric
 - 5) TK Products, Inc.; TK TWF
 - b. Characteristics:
 - 1) Type: Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive.
 - 2) Stainless steel type: 304, ASTM A167.
 - 3) Fabric: polymer fabric; laminated back face of stainless steel core.
 - 4) Size: Manufacturer's standard width rolls.
 - c. Accessories:
 - 1) Mastick/sealant: Basis-of-Design: York Manufacturing, Inc.; UniverSeal US100.
 - (a) Type: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50.
 - 2) Outside corner and inside corner material; manufacturer's standard available units using:
 - (a) Stainless steel: 26 gauge stainless steel.
 - 3) End Dam: Product may be folded in line with the flashing material or utilize preformed end dams by manufacturer using:
 - (a) Stainless steel: 26 gauge stainless steel.
 - 4) Splice material: Basis-of-Design: York 304 SS by York; manufacturer's standard self-adhered metal material; material matching system material or use Multi-Flash Stainless Steel 6" lap piece and polyether sealant as a splice.
 - 5) Termination Bar: Basis-of-Design: York T-96 termination bar; manufacturer's standard 1" composite material bar or a 1" 26 gauge stainless steel termination bar with sealant lip.
 - 6) Weep vent protection: Basis-of-Design: York's Weep Armor; geotextile drainage fabric at least 12" in height.
 - 7) Repair and other materials/accessories: Manufacturer's standard.
 - 8) Fasteners: Domestic manufactured fastener types and sizes recommended by flashing manufacturer for intended use.
 2. Flexible Stainless Steel Drainage Plane Flashing:
 - a. Product: Flash-Vent Stainless Steel by York, complete with sealants, termination bars, splice material, stainless steel corners.
 - b. Characteristics:
 - 1) Provides continuous weep vent.
 - (a) Selection of this option allows contractor to eliminate separate cavity drainage material; weep vent inserts in brick head joints are still required.
 - 2) Fire Resistant: Passes ASTM E84, Class A.

- D. Flexible flashing will not extend beyond face of mortar joint at any time; where drip is indicated, drip to be provided by use of stainless steel drip plates.

E. Stainless Steel Drip Plates:

1. Provide at flexible flashing locations, as indicated.
2. Material: Minimum 26 gage stainless steel.
3. Profile:
 - a. Provide with closed hemmed drip edge to extend past face of wall.
 - b. Provide vertical leg extending up backup wall minimum 2 inches.
 - c. Provide pitch in drip plate as indicated on Drawings.
 - d. Provide shop fabricated inside and outside corner.
 - e. At lip brick profiles, match profile with step in drip plate.
4. Flexible flashing will cover drip plate; cut flush with face of mortar joint.
5. Provide 1/8 inch thick sealant tape between drip plate and steel structural member.
6. Bond flexible flashing to drip plate as recommended by flexible flashing manufacturer; product selection to ensure against adhesive drool beyond face of brick.
7. Backer rod and sealant to be provided under drip edge per Division 7, at locations protecting steel.

F. Drip Plate Fasteners - CMU Backup: Use low-velocity powder actuated ballistic point fastener with pre-mounted washer; submit ICC-ES Evaluation Report under product data submittals indicating fastener selection appropriate for intended use.

G. Drip Plate Fasteners - Stud Backup: Corrosion-resistant screws located at every stud line.

H. Self-adhering Flashing Seam Tape: Flexible stainless steel; stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive.

2.6 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of air space, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Panels designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Net USA, Ltd; Product Mortar Net: www.mortarnet.com/#sle.
 - 2) Keene Building Products; Product Keenestone Cut 2".
 - 3) Hohmann and Barnard, Inc.; Product Mortar Trap.

C. Cavity Vents: Polyester mesh or cellular insect-resistant vents.

1. Locations: Flashing location at base of cavity wall construction.
2. Manufacturers:
 - a. CavClear/Archovations, Inc: www.cavclear.com/#sle.
 - b. Dur-O-Wal; Product D1006 Cell Vents: www.dur-o-wal.com.
 - c. Hohmann & Barnard, Inc; Product Quadro-Vent: www.h-b.com/#sle.
 - d. Mortar Net USA, Ltd; Mortar Net Weep Vents: www.mortarnet.com/#sle.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, as recommended by brick manufacturer.

2.7 LINTELS

A. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as required and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.8 MORTAR AND GROUT MIXES

- A. 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, brick veneer: Type N.
 - 4. Interior, loadbearing masonry: Type N, except reinforced masonry to be Type S.
 - 5. Interior, non-loadbearing masonry: Type O or Type N (Contractor's discretion).
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. 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.

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.

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 TMS 402/602 or applicable building code, whichever is more stringent.

3.4 INSTALLATION - GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Do not install cracked, broken or chipped masonry units for any location to be exposed in completed work; do not install cracked, broken or chipped masonry units exceeding ASTM allowances in work to remain concealed or within mechanical or electrical spaces.
- E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp,

unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 46.

3.5 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. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- E. Brick Units:
 - 1. Bond: Running.
 - 2. Mortar Joints: Concave.

3.6 PLACING AND BONDING

- A. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Interlock intersections and external corners.
- D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- F. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied.
- G. Pointing:

1. During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar.
 2. Point joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance.
 3. Prepare joints for sealant application, where indicated.
- H. Isolate masonry partitions from vertical structural framing members with a control joint and flexible anchors.
- I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.7 CAVITY VENTS

- A. Place cavity vents such as two consecutive vertical joints will include vent followed by a vertical joint without; repeat this placement for full length of application.
- B. Install vents in contact with flashing, full-width of head joint and uninterrupted by mortar.

3.8 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 indicated on Drawings and as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.9 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere.
 1. Space reinforcement not more than 16 inches o.c.
 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
 - a. Reinforcement of this subparagraph 3 is in addition to continuous reinforcement.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- 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.
 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated.
 2. Keep open space free of mortar and other rigid materials.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Typical: Place masonry joint reinforcement in first and second horizontal joints above and below openings.

1. Extend minimum 16 inches each side of opening.
 2. Modify placement where flashing occurs in joint; flashing takes precedent; joint reinforcement location adjusted as accepted by Architect.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 16 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.
- F. 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.
- G. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.11 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 of openings and at least 4 inches into adjacent masonry at each end; turn up not less than 2 inches to form end dams.
 2. Carry flashing across air space behind veneer and up face of backup construction at least 8 inches to form watertight pan; extend flashing into masonry backup minimum 1-3/4 inches; secure flashing with termination bar and seal.
 3. Remove or cover protrusions or sharp edges that could puncture flashings.
 4. Seal lapped seams of stainless steel drip plates with self-adhering flashing seam tape; stop self-adhering flashing seam tape 3/8 inch of brick face and extend over turned up edge 3 inches onto backup construction; center tape on overlapping edge.
 5. Seal lapped ends and penetrations of flashing with adhesive or sealant, as recommended by flashing manufacturer, before covering with mortar.
- B. Lap end joints of flashings at least 6 inches and seal watertight as recommended by flashing manufacturer.

3.12 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.

3.13 GROUTED COMPONENTS

- A. Lap splices minimum 48 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.
- D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 48 inches.

3.15 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.16 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- E. Do not build into masonry construction organic materials that are subject to deterioration.

3.17 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 Joint Thickness: 1/8 inch in 3 ft.

3.18 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.19 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140 for conformance to requirements of this specification.
- D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.
 - 1. Test three samples for each 5,000 square feet of wall or portion thereof; test one sample at 7 days and two at 28 days for each set.
- E. Test weep holes by pouring a bucket of water in cavity space at appropriate intervals of brick laying; clear weep holes that do not weep water from cavity space, including removal of wall as necessary to provide a proper functioning cavity drainage. Test frequency as necessary to confirm working condition of minimum 75 percent of weep vents. Testing to be witness by a third-party inspector/agency.

3.20 REPAIRING WORK

- 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.

3.21 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.22 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 72 00 - CAST STONE MASONRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Architectural cast stone; wet cast and acid-wash finish.
- B. Units required are:
 - 1. Exterior wall units, including wall caps, coping, sills, water tables, and bands.
 - 2. Date stone as detailed on the drawings.
 - 3. Other items indicated on drawings.

1.2 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- B. Section 07 90 05 - Joint Sealers: Materials and execution methods for sealing soft joints in cast stone work.

1.3 DESIGN REQUIREMENTS

- A. Wind Loads:
 - 1. Design anchors to withstand positive and negative wind loads acting normal to plane of wall, including increased loads at building corners.
 - 2. Design Wind Load: To design pressure of 25 psf.
- B. Design anchor attachment to cast stone with factor of safety of 5:1.
- C. Design each individual anchor with factor of safety in vertical dead-load-bearing direction of 4:1 and in horizontal lateral-load-bearing direction of 2:1.
- D. Fabrication to be per methods allowed under ASTM C 1364; wet cast.

1.4 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- B. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- D. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- E. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- G. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- H. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.
- I. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- J. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2010b.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. LEED Submittals: Comply with Section 018113.

1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content cast stone, if applicable: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For cast stone having regionally sourced recycled material, if applicable: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Product Data: Test results of cast stone components made previously by the manufacturer.
 1. Include one copy of ASTM C1364 for Architect's use.
- D. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- E. Mortar Color Selection Samples.
- F. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.
- G. Source Quality Control Test Reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
 2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
 3. Design anchors, cast units under direct supervision of Professional Engineer experienced in design of this Work and licensed in jurisdiction.
- B. Mock-Up: Provide full size cast stone components for installation in mock-up of exterior wall.
 1. Remove mock-up not incorporated into the work and dispose of debris.
- C. Source Quality Control: Test compressive strength and absorption of specimens selected at random from plant production.
 1. Test in accordance with ASTM C642.
 2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.
 3. Submit reports of tests by independent testing agency, showing compliance with requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Architectural Cast Stone:
 - 1. Reading Rock.
 - 2. Arban Precast Stone, Ltd..
 - 3. Midwest Cast Stone.
 - 4. Nelson Precast.

2.2 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364; wet cast type.
 - 1. Compressive Strength: Minimum 7,000 psi as specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 2. Freeze-Thaw Resistance: Demonstrated by field experience.
 - 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 5 feet.
 - 4. Color: Selected by Architect from manufacturer's full range.
 - 5. Remove cement film from exposed surfaces, by means of acid wash, before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 - 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
 - 3. Lengths:
 - a. Window Heads: Refer to Drawing elevations; as directed by Architect when not indicated.
 - b. Coping, water table or similar type banding: Longest length practicable, as accepted by Architect.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
 - 1. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material.
 - 2. All reinforcement shall have minimum coverage of twice the diameter of the bars.
 - 3. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction.
 - 4. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.
 - 5. Minimum amount of reinforcing shall be 0.25 percent of the cross section area.

2.3 MATERIALS

- A. Portland Cement: ASTM C150.
 - 1. For Units: Type I or II, white.
 - 2. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
 - 1. Provide colored mortar for exposed cast stone work; color to be selected by Architect.
- E. Admixtures: ASTM C494/C494M.
- F. Integral Water-repellant: Standard product accepted by cast stone fabricator within the mix design; product for mix design and setting mortar to be from same source.
 - 1. Provide for all units and mortar.
- G. Water: Potable.
- H. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized or epoxy coated.
- I. Steel Welded Wire Reinforcement: ASTM A185/A185M, galvanized or epoxy coated.
- J. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- K. Mortar: Portland cement-lime, ASTM C 270, Type N; do not use masonry cement.
- L. Sealant: As specified in Section 07 90 05.
- M. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.4 FABRICATION

- A. General Requirements: Fabricate units straight and true to component shapes detailed, and with accurate dimension control.
 - 1. Provide holes, sleeves, and slots to receive anchors and dowels and to provide drips.
 - 2. Provide reinforcement as shown on the approved shop drawings.
 - 3. Provide anchors, inserts, dowels, etc. in accordance with approved shop drawings and as required for proper installation of cast stone units.
- B. Joints in sills and headers on multiple windows to occur at center of mullions or columns, or constructed with two equal length pieces with joint occurring in centerline of window elevation.
- C. Compressive Strength: 7,000 psi at 28 days.
- D. Air Entrainment: Not less than 4-1/2 percent nor more than 6 percent.
- E. Curing - Wet Cast Method: Cure in form overnight within a climate controlled environment.
- F. Finish: Acid wash.

2.5 SOURCE QUALITY CONTROL

- A. Test and analyze three random specimens for each 500 cubic feet, or portion thereof, of fabricated cast stone units:

1. Compressive Strength: In accordance with ASTM C1194.Cold Water Absorption: In accordance with ASTM C1195.
2. Resistance to Freezing and Thawing: In accordance with ASTM C666; maximum cumulative percent mass loss in accordance with ASTM C1364.
3. Visually inspect color differences between fabricated units and approved sample in accordance with ASTM D1729.
4. Absorption: ASTM C1195; maximum 6 percent for cold water and 10 percent for boiling water at 28 days.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
 1. Drench cast stone components with clear, running water immediately before installation.
 2. Set units in a full bed of mortar unless otherwise indicated.
 3. Fill vertical joints with mortar.
 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 5. Do not shift or tap cast stone units after mortar has achieved initial set; where adjustment is required, remove mortar and replace.
 6. Keep exposed faces free of mortar; immediately remove mortar that comes in contact with faces using brush and clean water.
- D. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 1. Rake mortar joints 3/4 inch for pointing.
 2. Remove excess mortar from face of stone before pointing joints.
 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, cornices and sills.
 - b. Joints in projecting units.
 - c. Joints below lugged sills.
 - d. Joints below ledge and relieving angles.
 - e. Joints labeled "expansion joint".
 5. Cut out defective mortar joints and repoint.
- E. Sealant Joints: Install sealants as specified in Section 07 90 05.
- F. Installation Tolerances:
 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.
- G. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 5 feet.
1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
 2. Repair methods and results subject to Architect 's approval.
- 3.3 CLEANING
- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 5 feet.
1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
 2. Repair methods and results subject to Architect 's approval.
- B. Keep cast stone components clean as work progresses.
- 3.4 PROTECTION
- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.
- C. Protect from splashing by mortar and other damage.

END OF SECTION

SECTION 04 73 23 - MANUFACTURED STONE CLADDING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Manufactured stone cladding where indicated on the drawings.
 - 1. Terms "Manufactured Stone Cladding" and "Building Stone" to be interchangeable and of the same meaning within the Construction Documents.

1.2 SHOP DRAWINGS

- A. Indicate sizes and sections of stone, arrangements of joints and bonding, anchoring, dowelling and cramping.
- B. Each stone indicated on shop drawings must bear corresponding number marked on its back or bed or on the package labeling.

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For stone masonry: Industry-wide or product-specific EPD.

1.4 SAMPLES

- A. Submit three samples of limestone dimension stone to illustrate color and pattern range, and finish texture.

1.5 QUALITY ASSURANCE

- A. Fabricator: Company having sufficient capacity to quarry, cut, and deliver the stonework on schedule.
- B. Installer: Company or person specializing in commercial stone work with 10 years experience. Employ skilled stone fitters at the site to do necessary field cutting as stones are set.
- C. Obtain stone from a single quarry source with resources to provide materials of specified consistent quality.

1.6 MOCKUPS

- A. Incorporate into mock up specified in Section 04 20 00.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Manufacturer shall deliver product to job site as scheduled.
- B. Manufacturer shall separate stone layers in each cube with spacers to prevent product damage.
- C. Stone cubes shall be shrink wrapped at time of delivery.
- D. Product shall be delivered on wooden pallets.
- E. Product shall be placed on stable soil.
- F. Product shall not be stacked greater than two cubes high.
- G. White products shall be stacked one cube high only.
- H. Product shall remain shrink wrapped until time of installation.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Conform to requirements of ACI 530.1/ASCE 6/TMS 602, Specifications for Masonry Structures, Part 1.8.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Shouldice Estate Stone, Bradford Blend.
- B. Reading Rock; RockCast Caliza Stone Series.
 - 1. Ashlar Series, Ohio Split ST-005; 2-piece Ashlar Pattern.
 - 2. Color match to Architect's sample.

2.2 MATERIALS

- A. Masonry Units shall meet ASTM C90 Specifications.
- B. Units shall be manufactured with integral water repellent additive.
- C. Units shall be uniform and consistent in colour
- D. Refer to drawings for unit options locations and quantities.
- E. Mortar Types: Refer to Section 04 20 00, Unit Masonry.
 - 1. Loadbearing: Type S based on specifications.
 - 2. Non-Loadbearing: Type N based on specifications
 - 3. Mortar color shall be a custom color as selected by Architect.
 - 4. Mortar joint shall be concave unless otherwise specified.
- F. Veneer Anchorage and Ties: Refer to Section 04 20 00, Unit Masonry.

2.3 ACCESSORIES

- A. Anchors, Cramps, Dowels: to ASTM C1242, stainless steel, Type 304 as recommended by manufacturer.
- B. Bed Reinforcement: as specified in Section 04 20 00.
- C. Through-Wall and Flexible Flashing: as specified in Section 04 20 00.
- D. Weep Vents: as specified in Section 04 20 00.
- E. Sealant and Backer Rod: as specified in Section 07 90 05.

PART 3 EXECUTION

3.1 PREPARATION

- A. Apply asphalt emulsion to concrete surfaces, shelf angles, structural steel supports against which stone is to be applied.
- B. Clean stone surfaces by washing with stiff fiber brush and water.

3.2 SETTING STONE - GENERAL

- A. Set stones plumb, true, and level, to requirements indicated on drawings and approved shop drawings.
- B. Align stone edges and faces according to established relationships and indicated tolerances.
- C. Provide movement joints of widths and at locations indicated on drawings. Do not fill movement joints with mortar.

3.3 SETTING STONE WITH MORTAR

- A. Set stones in full bed of mortar with vertical joints buttered and placed full, except where otherwise specified. Completely fill anchor, dowel and lifting holes.
- B. Lay stone panel cladding to patterns indicated on Drawings. Install anchors, dowels and cramps. Shim and adjust supports to set stones accurately in locations indicated with uniform joints of widths indicated.
- C. Make joints 3/8" thick.
- D. Embed only ends of lugged sills and steps in mortar. Leave balance of joint open for final pointing.
- E. Place setting buttons under stones to maintain joint thickness. Set heavy stones and projecting courses after mortar in courses below has hardened sufficiently to support weight.
- F. Brace and anchor projecting stones until wall above is set.
- G. Use soaked softwood wedges to support stone in proper alignment until mortar has set. Remove wedges when dry and without breaking them off, fill voids with pointing mortar.
- H. Install through-wall flashing membranes at continuous shelf angles, steel lintels, ledges and similar obstructions to the downward flow of water.
- I. Tool joints after initial set has occurred.
- J. Pointing:
 - 1. Remove dirt and loose mortar from joints by using pressurized air stream.
 - 2. Wet joints for mortar pointing. Dry joints for sealant pointing.
 - 3. Point joints with pointing mortar in two stages. Rub smooth with appropriate tool to slightly concave joint.
 - 4. Point movement joints with sealant. Conform to Section 07 90 05.

3.4 SITE TOLERANCES

- A. Variation from Plumb: plus or minus 1/4" per 10 feet maximum.
- B. Variation from Level: plus or minus 1/2" per 20 feet maximum.
- C. Variation from Linear Building Line: plus or minus 1/2" per 20 feet maximum.
- D. Variation in Cross-Sectional Dimensions: plus 1/2" or minus 1/4".

3.5 FIELD QUALITY CONTROL

- A. Architect Inspection: Architect will inspect installed dimension stone and reject stone that is chipped, cracked, or blemished (streaked, stained or otherwise damaged), as described below.
 - 1. Stone will be inspected to be free of spalls, cracks, open seams, pits or other defects that are likely to impair its structural integrity in its intended use.
 - 2. Units shall exhibit a texture approximately equal to the approved sample when viewed under diffused daylight illumination at a 10 foot distance.
 - 3. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under diffused daylight illumination from a 10 foot distance.
- B. Make Good rejected masonry as directed by Architect.

3.6 ADJUSTING AND CLEANING

- A. Repair chips with patch kits furnished by manufacturer.

- B. Clean stone as work progresses.
- C. Allow mortar droppings on stone to partially dry then remove by means of brushing with a stiff fiber brush.
- D. Post-Construction: Clean a 100 sq. ft. area of wall as directed below and leave for one week. If no harmful effects appear and after mortar has set and cured, clean masonry as follows:
 - 1. Protect windows, sills, doors, trim and other work from damage.
 - 2. Remove large particles with stiff fiber brushes or wood paddles without damaging surface.
 - 3. Saturate stone with clean water and flush off loose mortar and dirt.
 - 4. Dilute cleaning agent with clean water in controlled proportions.
 - 5. Apply solution to pre-soaked wall surface using soft-bristled brush.
 - 6. Thoroughly rinse cleaning solution and residue from wall surface.
- E. Use alternative cleaning solutions and methods for difficult to clean stone only after consultation with stone manufacturer.

3.7 PROTECTION

- A. Protect stone from damage resulting from subsequent construction operations.
- B. Use protection materials and methods which will not stain or damage stone.
- C. Remove protection materials upon Substantial Completion, or when risk of damage is no longer present.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Structural steel framing members, support members and struts.
- B. Base plates, shear stud connectors and expansion joint plates.
- C. Grouting under base plates.

1.2 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2011.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2010.
- C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; 2004.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- I. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
- J. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.
- K. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2014a.
- L. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric); 2014a.
- M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- N. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- O. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).
- P. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.
- Q. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- S. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.
- T. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.

- U. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.
- V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- W. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate cambers and loads.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
 - 5. For structural-steel connections indicated to comply with design loads, connections and structural analysis data shall be signed and sealed by the qualified Professional Engineer licensed in the State of Maryland responsible for their preparation.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Signed by manufacturer certifying that the product complies with specified requirements. Indicate structural strength, destructive test analysis and non-destructive test analysis.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel: Industry-wide 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 recycled content steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.4 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
- B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
- C. Maintain one copy of each document on site.
- D. Fabricator: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and within 15 percent this project size, with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
 - 1. Fabricator must be designated as an AISC-certified plant, Category STD.
 - 2. Contractor Option: Comply with the following procedures instead of engaging an AISC-Certified Plant:
 - a. Demonstrate that the fabricator has in place a quality control program for meeting IBC requirements and compliance with AISC recommendations and standards.

- b. At no additional cost to the Owner, provide for an independent field inspection of fabrications and welding to comply with IBC, AISC and AWS recommendations and standards.
 - c. Provide certified shop inspection reports signed by the fabricator and an independent inspection agency indicating that the steel, as fabricated, complies with requirements of Contract Documents.
 - d. Provide shop drawings signed and sealed by a qualified licensed Structural Engineer, within the project jurisdiction, responsible for design of connections.
 - e. The steel fabricator shall provide signed and sealed field modification details with backup computations for all field revisions.
 - f. Field modifications details and computations must be prepared by same licensed Structural Engineer preparing shop drawings.
3. Provide documentation that fabricator has provided material for and erected at least 3 projects within 15 percent of project size and complexity, in the last 6 years.
- E. Erector: Company specializing in performing the work of this Section with minimum 5 years of documented experience.
- F. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.

PART 2 PRODUCTS

2.1 MATERIALS

- A. 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.
- B. Regionals Materials: Provide at least 25 percent of steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- C. Steel Angles and Plates: ASTM A36/A36M.
- D. Steel W Shapes and Tees: ASTM A992/A992M.
- E. Cold-Formed Structural Tubing: ASTM A500, Grade B.
- F. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.
- G. Pipe: ASTM A53/A53M, Grade B, Finish black.
- H. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B..
- I. Rods: ASTM A 36/A 36M.
- J. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A Nuts: ASTM 563 hex carbon steel. Washers: ASTM F436, hardened carbon steel.
- K. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1. Nuts: ASTM 563 hex carbon steel. Washers: ASTM F436, hardened carbon steel.
- L. High-Strength Structural Bolts: ASTM A490 (ASTM A490M), with matching ASTM A563 (ASTM A563M) nuts and ASTM F436 washers; Type 1 alloy steel.

- M. Headed Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or A 563M nuts and ASTM F436 Type 1 washers.
- N. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.
- O. Welding Materials: AWS D1.1; type required for materials being welded.
- P. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- Q. Shop and Touch-Up Primer: Type specified in Division 9 painting sections, complying with VOC limitations of authorities having jurisdiction.
- R. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Develop required camber for members.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements of AWS D1.1.
- D. Bolt Holes: Drill or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

2.3 FINISH

- A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
- B. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
 - 1. Galvanize shelf angles, lintels and hung plates located in exterior walls.
 - 2. Galvanize all exterior steel.
- C. Surface preparation: SSPC-SP2: "Hand Tool Cleaning", or SSPC-SP3, "Power Tool Cleaning".
- D. Provide a dry film thickness of not less than 1.5 mil.
- E. Refer to Division 9 painting sections for primer specifications.

2.4 SOURCE QUALITY CONTROL

- A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.
- B. Welded Connections: Visually inspect all shop-welded connections and test all full penetration welds using ultrasonic testing performed in accordance with ASTM E 164.

PART 3 EXECUTION

3.1 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components and shear studs indicated on shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete. Repair damaged galvanized coatings with galvanized repair paint.
- G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.2 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00. Inspection services shall conform to Section 1704.3 and Table 1704.3 of the IBC 2015 - International Building Code. Inspection services shall include, but not be limited to, setting of all bearing plates, alignment of structural members, all joints prior to welding for required clearance and preparation, and all welded and bolted connections.
- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", A minimum of 10% of all bolted connections are to be tested. All bolted connections to have a visual inspection and any suspect connections are to be tested.
- C. In addition to visual inspection, field-welded shear connectors shall be tested and inspected according to the requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector. A minimum of 25% of the Nelson studs are to be hammer tested. If more than 10% fail this test than 40% of the studs are to be tested.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.
- D. Correct deficiencies in work that inspections indicate does not comply with the specified requirements.

END OF SECTION

SECTION 05 21 00 - STEEL JOIST FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Open web steel joists , with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for floor and roof openings greater than 12 inches.
- D. Joist accessories.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- C. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.
- D. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- E. IBC 2015 - International Building Code.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
 - 1. Indicate locations and details of bearing plates to be embedded in other construction.
 - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer licensed in the State of Maryland who is responsible for its preparation.
- C. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel: Industry-wide 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 recycled content steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
 - 1. Manufacturer's Certificates: Signed by manufacturers certifying that joists comply with requirements.
 - 2. Manufacturer's Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
 - 3. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.
 - 4. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Manufacturer must be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.
 - 2. Assumes responsibility for engineering special joists to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 3. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of joists that are similar to those indicated for this Project in material, design, and extent.
- B. SJI Specifications: Comply with SJI's "Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders" (hereafter, "Specifications"), applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3 "Structural Welding Code--Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Canam Group Inc: www.canam-steeljoists.ws
- B. CMC Joist: www.cmcjoist.com.
- C. Nucor-Vulcraft Group: www.vulcraft.com/#sle.

2.2 MATERIALS

- A. Recycled Content: Provide steel with minimum 30 percent total recycled content including at least 25 percent post-consumer recycled content.
- B. Regionals Materials: Provide at least 25 percent of steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- C. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. End bearing of 2-1/2 inches on steel supports.
 - 3. End bearing of 4 inches on masonry supports.
 - 4. Finish: Shop primed.
 - 5. Steel: Comply with SJI's "Specifications" for chord and web members.
- D. Open Web Joists: SJI Type LH and DLH Joists:
 - 1. Provide bottom and top chord extensions as indicated.
 - 2. End bearing of 4 inches on steel supports.
 - 3. End bearing of 6 inches on masonry supports.
 - 4. Finish: Shop primed.
 - 5. Steel: Comply with SJI's "Specifications" for chord and web members.

- E. Bolts, Nuts and Washers: ASTM A 307, Nuts: ASTM A563, Washers: ASTM F436; plain.
- F. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Shop and Touch-Up Primer: Type specified in Section 09 91 23, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

- A. Manufacture steel joists to meet SJI's "Specifications", with steel angle top and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber steel joists according to SJI's "Specifications".
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds ¼ inch per twelve inches.
- F. Bridging: Provide bridging anchors and number of rows of horizontal and diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Provide additional erection bridging if required for stability and where indicated on the Drawings.
- G. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- H. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within ½ inch of finished wall surface unless otherwise indicated.
- I. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.4 FINISH

- A. Prepare surfaces to be finished in accordance with SSPC-SP 2.
- B. Apply shop primer to joists and joist accessories to provide a continuous dry paint film not less than 2 mil thick; apply two coats of shop primer if necessary to meet specified dry film thickness.

PART 3 EXECUTION

3.1 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. Coordinate placement of anchors in concrete and masonry construction for securing bearing plates.

- F. After joist alignment and installation of framing, field weld joist seats to bearing plates.
- G. Position and field weld joist chord extensions and wall attachments as detailed.
- H. Install supplementary framing for roof openings greater than 18 inches.
- I. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- J. Do not field cut or alter structural members without approval of joist manufacturer.
- K. After erection, prime welds and damaged shop primer, except surfaces specified not to be primed.

3.2 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.3 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Carbon Steel Bolts: Field-bolted connections will be visually inspected and shall conform to ASME B18.2.6-96 Fasteners for Use in Structural Applications and A307-03 Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
- C. Welded Connections: Visually inspect all field-welded connections and test 100 percent of full-penetration welds using ultrasonic testing performed in accordance with ASTM E 164.
- D. Correct deficiencies in work that inspections indicate are not in compliance with specified requirements.

END OF SECTION

SECTION 05 31 00 - STEEL DECKING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Acoustical roof deck.
- B. Roof deck.
- C. Composite floor deck.
- D. Metal form deck.
- E. Supplementary framing for openings up to and including 12 inches.
- F. Bearing plates and angles.
- G. Stud shear connectors.
- H. Acoustical insulation in roof deck flutes.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- E. 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; 2016.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- G. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.
- H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.3 PERFORMANCE REQUIREMENTS

- A. Select and design metal deck in accordance with SDI Design Manual.
- B. Calculate to structural working stress design and structural properties specified.
- C. Maximum Vertical Deflection of Floor Deck: 1/360.
- D. Maximum Vertical Deflection of Roof Deck: 1/240.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, cellular raceways and outlet box locations, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.

- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel: Industry-wide 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 recycled content steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Canam Steel Corporation: www.canam-steeljoists.ws.
- B. Consolidated Systems, Inc.
- C. Epic Metals Corporation.
- D. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
- E. Wheeling Corrugating Co: www.wheelingcorrugating.com.
- F. United Steel Deck , Inc: www.njb-united.com.

2.2 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 - 1. Calculate to structural working stress design and structural properties specified.
 - 2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
 - 3. Maximum Vertical Deflection of Roof Deck: 1/240.
 - 4. Maximum Vertical Deflection of Form Deck: 1/360 of span.
- B. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) , with G60/Z180 galvanized coating for indoor locations and G90/Z275 galvanized coating for outdoor locations.
 - a. Grade as required to meet performance criteria.
 - 2. Structural Properties:
 - a. Section modulus: As indicated on the Drawings.
 - b. Span Design: Multiple.
 - 3. Minimum Metal Thickness, Excluding Finish: 22 gage.
 - 4. Nominal Height: 1-1/2 inch.
 - 5. Profile: Fluted; SDI WR.

6. Formed Sheet Width: 36 inch.
 7. Side Joints: Lapped, mechanically fastened.
 8. End Joints: Lapped, welded.
 9. Recycled Content: Provide steel with minimum 50 percent total recycled content including at least 25 percent post-consumer recycled content.
- C. Acoustical Roof Deck:
1. Products:
 - a. EA Acoustical Roof Deck units by Epic Metals Corporation; round perforations.
 - b. Type BA deck by United Steel Deck, Inc.; round perforations.
 - c. Type BA deck by Consolidated Systems, Inc.; round perforations.
 - d. Type BA deck by Vulcraft; round perforations.
 - e. Type CFDA deck by Consolidated Systems, Inc.; round perforations.
 2. Cold-formed from steel sheets conforming to ASTM A653, Grade 40, or equal, having minimum yield strength of 40,000 psi.
 3. Before forming, the steel sheets shall have received a hot-dip protective coating of zinc conforming to ASTM A924 with a minimum coating class of G60/Z180 as defined in A653.
 4. The minimum uncoated thickness of material supplied shall be within 5 percent of the design thickness.
 5. Acoustical roof deck units shall have full depth positive registering sidelaps that can be fastened by welds or screws, or locking male/female laps.
 6. Whenever possible, acoustical roof deck units shall be fabricated to provide a minimum three span condition.
 7. Insulation:
 - a. Sound absorbing elements of 3 pound density fiberglass shall be factory installed within the deck cells; minimum 1-1/2 inch thickness.
 - b. To facilitate field painting of the perforated surfaces, the sound absorbing elements shall be supported above the panel on standoffs.
 - c. NRC System Rating: 0.90 minimum.
 8. Finish:
 - a. Cleaned, chemically treated and painted with 0.2 mil epoxy primer followed by a 0.5 mil polyester top coat primer oven cured off-white.
 - b. Contractor Option: The Contractor may provide a finish of 0.2 mils weldable urethane primer followed by a 3.0 mils minimum of Tnemec FC 20 Epoxy (off white) sprayed on and air dried.
- D. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - a. Grade as required to meet performance criteria.
 2. Primer: Shop coat over cleaned and phosphatized substrate.
 3. Structural Properties:
 - a. Section modulus: As indicated on the drawings.
 4. Span Design: Multiple.
 5. Minimum Metal Thickness, Excluding Finish: 20 gage.
 6. Nominal Height: 2 inches.
 7. Profile: Fluted; SDI WR.
 8. Formed Sheet Width: 36 inch.
 9. Side Joints: Lapped, welded.
 10. End Joints: Lapped, welded.

- E. Metal Form Deck: Corrugated sheet steel:
 - 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

2.3 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel.
- B. Stud Shear Connectors: Made from ASTM A 108 Grade 1015 bars.
- C. Welding Materials: AWS D1.1.
- D. Fasteners: Galvanized hardened steel, self tapping.
- E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- F. Shop and Touch-Up Primer: Type specified in Section 09 91 23, complying with VOC limitations of authorities having jurisdiction.
- G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.
- H. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.
- I. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft density; profiled to suit deck.

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage thick sheet steel minimum; of profile and size as indicated; finished same as deck.
- B. Cant Strips: Formed sheet steel, 16 gage thick, 45 degree slope, 3 1/2 inch nominal width and height, flange for attachment.
- C. Roof Sump Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.
- D. Floor Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before permanently fastening..
- C. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work..
- D. Weld deck in accordance with AWS D1.3.
- E. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion welded 12 inches on center maximum.
- F. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

- G. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- H. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- I. Place metal cant strips in position and field weld.
- J. Weld stud shear connectors through steel deck to structural members below.
- K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

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: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panel at each support; space additional welds as indicated on Drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as indicated on Drawings.
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. 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 lapped 2 inches minimum.

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: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge ribs of panel at each support and at 12" on center.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as indicated on Drawings:
 - 1. Fasten with a minimum of 1-1/2-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints butted.

3.5 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspection to include, but not limited to, deck alignment, support, welds, side lap attachment and touch-up galvanizing.
- C. Testing agency to 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, must be performed to determine compliance of corrected work with specified requirements.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED METAL FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Formed steel stud exterior wall framing.
- B. Formed steel joist framing and bridging.

1.2 REFERENCE STANDARDS

- A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- 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; 2016.
- E. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- H. International Building Code.

1.3 DESIGN REQUIREMENTS

- A. Axial and wind load bearing elements shall be designed to the following conditions unless more stringent requirements are imposed by governing code; these requirements take precedent when more stringent than governing code.
 - 1. Gravity Loads: Per ASCE 7-2005.
 - 2. Wind Loads: Per ASCE 7-2005.
 - 3. Seismic Loads: Per ASCE 7-2005.
- B. Maximum Allowable Deflection:
 - 1. Backing of Masonry Veneer: 1: 600.
 - 2. Other Systems: 1: 240 of span.
- C. Wall and General System:
 - 1. Design to AISI SG-973 Cold-Formed Steel Design Manual.
 - 2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - 3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 4. Design to meet loading and anchorage requirements for window systems and curtainwall system must be based on calculations provided by the respective subcontractors.

5. Design cold-formed metal truss framing for exterior soffits to meet applicable wind uplift requirements.
6. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as in accordance with IBC code.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations .
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 1. Indicate stud, ceiling joist, roof joist, roof rafter, and roof truss layout.
 2. Describe method for securing studs to tracks and for bolted framing connections.
 3. Provide calculations for loadings and stresses of specially fabricated framing, stamped by a Professional Structural Engineer licensed in the State of Maryland, who is responsible for its preparation.
 4. Provide details, shop drawings and calculations for factory-made framing connectors, stamped by a Professional Structural Engineer licensed in the State of Maryland, who is responsible for its preparation.
- E. LEED Submittals: Comply with Section 018113.
 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel: Industry-wide 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 recycled content steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 3. MR Credit 4: BPDO - Material Ingredients
 - a. For steel, if available: Material Ingredient Report.

1.5 QUALITY ASSURANCE

- A. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 1. Maintain one copy of document on project site.
- B. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

- E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated on the drawings.

PART 2 PRODUCTS

2.1 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.2 FRAMING MATERIALS

- A. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
- B. Regional Materials: Provide at least 25 percent of steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- C. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gage and depth: As required to meet specified performance levels, but to be minimum 18 gage.
 - 2. Galvanized in accordance with ASTM A653/A653M G90/Z275 coating.
 - 3. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.
- D. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.
 - 1. Base Metal: Structural Steel (SS), Grade 33/230 minimum.
 - 2. Gage and depth: As required to meet specified performance levels.
- E. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
 - 1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 16 gage, 0.06 inch thickness.
 - 2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
 - a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
 - c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
 - d. Acceptable Products: VertiClip(r) or DriftClip(tm) manufactured by The Steel Network Inc.
 - 3. Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.3 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- C. Insulated Box Header: Provide 1-1/2 inch rigid foam board insulation in each stud used in a box header design. Refer to section 07 21 00 for material information on foam board insulation.

2.4 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1.

2.5 SHOP FABRICATED ASSEMBLIES

- A. Shop fabricate metal framing to the greatest extent possible.
- B. Fabricate assemblies of framed sections of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.1 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- D. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- E. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- F. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- I. Attach cross studs to studs for attachment of fixtures anchored to walls.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- K. Touch-up field welds and damaged galvanized surfaces with primer.

3.2 INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with manufacturer's instructions.

- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.
- D. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
- E. Provide web stiffeners at reaction points.
- F. Touch-up field welds and damaged galvanized surfaces with primer.

3.3 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

3.4 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing and inspection agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Perform inspections in order to assure strict conformance to the shop drawings at all phases of construction.
 - 2. Check members for proper alignment, bearing, completeness of attachments, proper alignment, reinforcement, etc.
 - 3. Check attachments for conformance with the shop drawings; all welds shall be touched up as specified.
 - 4. Complete general inspection of structure prior to applying loads to those members.
 - 5. Inspections where and as required by local codes shall be controlled inspections.

END OF SECTION

SECTION 05 44 00 - COLD-FORMED STEEL TRUSSES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Light gage cold-formed steel roof trusses.
- B. Anchorages, bracing, and bridging.

1.2 RELATED REQUIREMENTS

- A. Section 05 40 00 - Cold-Formed Metal Framing: Light gage structural metal studs, joists, and rafters.
- B. Section 06 10 00 - Rough Carpentry: Roof sheathing.

1.3 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).
- D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2008.
- G. CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses; May 2000.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Meet at project site prior to beginning of installation to review requirements. Require attendance by representatives of the following:
 - 1. Truss fabricator.
 - 2. Truss installer.
 - 3. Other entities affected by the work of this section, including but not limited to truss support framing installer.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Span charts.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel: Industry-wide 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 recycled content steel: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- 3. MR Credit 4: BPDO - Material Ingredients
 - a. For steel, if available: Material Ingredient Report.
- D. Shop Drawings:
 - 1. Include detailed roof truss layout.
 - 2. Show member type, location, spacing, size and gage, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.
 - 3. Include truss design drawings, signed and sealed by a qualified professional engineer registered in the State of Maryland, verifying ability of each truss design to meet applicable code and design requirements.
 - a. Include the following:
 - 1) Design criteria.
 - 2) Engineering analysis depicting member stresses and deflections.
 - 3) Member sizes and gages.
 - 4) Details of connections at truss joints.
 - 5) Truss support reactions.
 - 6) Bracing requirements.
- E. Designer's Qualification Statement.
- F. Fabricator's Qualification Statement.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland.
- B. Fabricator Qualifications: Steel truss fabricator with minimum 10 years of experience designing and fabricating truss systems equivalent to those required for this project and licensed by an acceptable manufacturer.
- C. Welders: Qualify welding processes and welding operators in accordance with AWS B2.1/B2.1M.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver trusses and other materials in manufacturer's unopened bundles or containers, each marked with manufacturer's name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.
- B. Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.
- C. Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

PART 2 PRODUCTS

2.1 TRUSS DESIGN REQUIREMENTS

- A. Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100-12.
- B. Structural Performance: Design, engineer, fabricate, and erect trusses to withstand specified design loads for project conditions within required limits.

1. Design Loads: In accordance with applicable codes.
 - a. Roof Live Loads: Refer to Drawings
2. Deflections: Live load deflection meeting the following, unless otherwise indicated:
 - a. Roofs: Maximum vertical deflection under live load of 1/240 of span.
3. Design trusses to accommodate movement attributable to temperature changes within a range of 120 degrees F without damage or overstressing, sheathing failure, undue strain on fasteners and anchors, or other deleterious effects.

2.2 COMPONENTS

- A. Trusses: Light gage steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.
 1. Truss Type, Span, and Height: As indicated on drawings.
 2. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 40,000 psi; minimum G90/Z275 coating; gages as required for load conditions; all edges rolled or closed.
- B. Fasteners: Self-drilling, self-tapping screw fasteners with corrosion-resistant plated finish, as recommended by steel truss manufacturer and marked for easy identification.
 1. Welding: Comply with applicable provisions of AWS D1.1/D1.1M and AWS D1.3/D1.3M.
- C. Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gages as required for load conditions.

2.3 FABRICATION

- A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with secure connections, complying with manufacturer's recommendations and project requirements.
 1. Fabricate trusses using jig templates.
 2. Cut truss members by sawing, shearing, or plasma cutting.
 3. Fasten members in full compliance with instructions of manufacturer. Wire tying of framing members is not permitted.
- B. Tolerances: Fabricate trusses to maximum allowable tolerance variation from plumb, level and true line of 1/8 inch in 10 feet.
 1. Up to 30 feet Long: Maximum plus or minus 1/2 inch from design length.
 2. Over 30 feet Long: Maximum plus or minus 3/4 inch from design length.
 3. Up to 5 feet High: Maximum plus or minus 1/4 inch from design height.
 4. Over 5 feet High: Maximum plus or minus 1/2 inch from design height.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine structure, substrates, and installation conditions. Notify Architect of unsatisfactory preparation. Do not begin installation until substrates have been properly prepared and unsatisfactory conditions have been corrected.
- B. Proceeding with installation indicates installer's acceptance of substrate conditions.

3.2 INSTALLATION

- A. Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.
- B. Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.
- C. Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.
- D. Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.
- E. Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect or the engineer of record and the truss manufacturer.
- F. Repair or replace damaged members and complete trusses as directed and approved in writing by Architect or the engineer of record and the truss manufacturer.
- G. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.
- H. Field Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M, as applicable, and as follows:
 - 1. Connections: Provide fillet, flat, plug, or butt welds, as indicated.
 - 2. Minimum steel thickness for welded connections, 18 gage, 0.0478 inch.
- I. Roof Trusses:
 - 1. Comply with recommendations of CFSEI 5000.
 - 2. Align truss bottom chords with load-bearing studs or continuously reinforce track as required to transfer loads to structure.
 - 3. Install continuous bridging and permanent truss bracing as indicated.
 - 4. Install roof cross bracing and diagonal bracing as indicated.

3.3 TOLERANCES

- A. Install trusses to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.
- B. Space individual trusses not more than plus or minus 1/8 inch from plan location. Cumulative error in placement may not exceed minimum fastening requirements of sheathing or other material fastened to trusses.

3.4 FIELD QUALITY CONTROL

- A. Owner will provide inspection service for inspection of field connections, in accordance with requirements of Section 01 40 00 - Quality Requirements.

3.5 PROTECTION

- A. Protect trusses from damage by subsequent construction activities.
- B. Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by Architect or the engineer of record and the truss manufacturer for all cutting, repairs, and replacements.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Rough hardware.
- B. Steel ladders.
- C. Loose bearing and leveling plates.
- D. Loose steel lintels.
- E. Shelf angles.
- F. Support angles for elevator door sills.
- G. Steel framing and supports for overhead doors.
- H. Steel framing and supports for countertops.
- I. Steel framing and supports for mechanical and electrical equipment.
- J. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- K. Miscellaneous metal trim.
- L. Metal bollards.
- M. Elevator sump grates.
- N. Miscellaneous storm drainage piping specialties.
- O. Pipe Grid.
- P. Prefabricated screen wall structure and gate. (Dumpster and Generator Enclosures)

1.2 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 SUBMITTALS

- A. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed products indicated to comply with design loads include structural analysis data and shop drawings signed by the qualified professional engineer responsible for their preparation.
- B. Samples representative of materials and finished products as may be requested by Architect.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.
- E. Qualification data for professional engineer responsible for designing fabrications indicated to comply with specific design loads.
- F. LEED Submittals: Comply with Section 018113.
 - 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.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Metal Surfaces, General:
 - 1. For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 - 2. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
 - 3. Recycled Content: Provide steel with minimum 30 percent total recycled content, 25 percent shall be post-consumer recycled content.
 - 4. Regional Materials: Provide steel manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.

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5. Domestic Origin: Consistent with the Maryland Annotated Code, Article 78A known as the "Buy American Steel" Act of the General Assembly of Maryland, Acts of 1978, provide steel manufactured in the United States of America.
 - B. Steel Sections: ASTM A 36/A 36M.
 - C. Steel Tubing: Product type (manufacturing method) and as follows:
 1. Cold-Formed Steel Tubing: ASTM A 500.
 2. Hot-Formed Steel Tubing: ASTM A 501.
 - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
 - D. Plates: ASTM A 283.
 - E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
 1. Galvanized finish for exterior installations and where indicated.
 2. Black finish elsewhere, unless otherwise indicated.
 - F. Gray-Iron Castings: ASTM A 48, Class 30.
 - G. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
 - H. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
 - I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.2 MATERIALS - ALUMINUM

- A. General:
 1. Recycled Content: Give preference to aluminum with the highest recycled content feasible.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6.

2.3 PAINT

- A. Shop Primer for Ferrous Metal - Interior Locations, Loose Lintels, Plates, etc.: Refer to Division 9 painting specifications.
- B. Shop Finish - Exterior Fabrications (Stairs, Ladders, Frames, etc):
 1. Prepare galvanized surfaces as required by paint manufacturer.
 2. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 3. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 4. This process provides an average of 8-10 mils total coating thickness.
 5. Color to be selected by Architect.
- C. Shop Finish - Stair Gate Fabrication:

1. Electrostatic application of epoxy powder primer with 375f minimum 15 minute duration heat cure for maximum corrosion protection.
 2. Immediate electrostatic application of TGIC polyester powder color coat while metal temperature is minimum of 300f and heat cure for minimum 10 minutes at 400f.
 3. This process provides an average of 8-10 mils total coating thickness.
 4. Color to be selected by Architect.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3.
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Material - General: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material - Exposed exterior or in contact with ground: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- H. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
1. Construction Grout; W. R. Bonsal Co.
 2. Sure-grip High Performance Grout; Dayton Superior Corp.
 3. Euco N-S Grout; Euclid Chemical Co.
 4. Crystex; L & M Construction Chemicals, Inc.
 5. Masterflow 928 and 713; Master Builders Technologies, Inc.
 6. Sealtight 588 Grout; W. R. Meadows, Inc.
 7. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.6 FABRICATION

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 120 deg F.
- D. Shear and punch metals cleanly and accurately; remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- M. Fabricate items with joints tightly fitted and secured.
- N. 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.

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

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel, 1/2-by-2-1/2-inch flat bars, with eased edges, spaced 18 inches apart.
- C. Bar Rungs: 3/4-inch diameter steel bars, spaced 12 inches o.c.
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
- F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to the rung by a proprietary process.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - a. Mebac, IKG Borden.
 - b. SLIP-NOT, W. S. Molnar Co.
- G. Galvanize ladders, including brackets and fasteners, in the following locations:
 - 1. Elevator pit.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Hot dip galvanize loose steel lintels located in exterior walls.

2.10 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors; furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.12 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other Work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.13 FRAME AND GRATE FOR ELEVATOR SUMP

- A. Basis-of-Design: Model R-4810-C by Neenah Foundry Company.
- B. Frames and grates to be Gray Iron, Class 35.

2.14 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

- A. Downspout Boots: Provide downspout boots made from cast gray iron in heights indicated with inlets of size and shape to suit downspouts.
 - 1. Outlet: NPS 4 (DN 100) outlet, to discharge into pipe.
 - 2. Cast with ears to attach to building.
 - 3. Size: Inlet size to match downspout and NPS 4 (DN 100) outlet.
 - 4. Finish: Prepare for field painting.

- B. Downspout Adaptors: Provide downspout adaptors made from cast gray iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
 - 1. Inlet size to match parapet drain outlet.

2.15 PIPE BOLLARDS

- A. Provide Schedule 40 black steel pipe of size and height indicated as detailed on the Drawings.
- B. Permanent Setting:
 - 1. Set posts in concrete to a depth of 3'-0"; footing diameter minimum 3 times post diameter.
 - 2. Fill posts completely with concrete and dome on top.
- C. Finish: Painted as specified in Division 9 "Exterior Painting."

2.16 PIPE GRID

- A. Provide pipe grid where indicated.
- B. Pipe grid consists of a set of pipe battens installed (in plan) perpendicular to the joists.
- C. Individual pipe battens in each set to be located on 6-foot centers.
- D. Rest end of pipe battens on a shelf angle (3 inches x 2 inches) on sides that have masonry wall and secure in place by means of "U" bolts at ends of all pipes.
- E. Rigidly support pipe grid by means of 1/2 inch threaded rods located on centers that shall not exceed 8 feet.
- F. Assemble entire grid into a unit structure.
- G. Pipe battens that compose the grid consists of 1-1/2 inch, Schedule 40, black pipe with battens spanning from wall to wall.
- H. Connect hangers to the overhead structure; hangers provided at each joist where joist crosses the line of the pipe batten.

2.17 SCREEN WALL STRUCTURE AND GATE

- A. Basis-of-Design: Barnett Bates Orsogril Talia 100 by Barnett Bates Corporation, or equivalent product of Ametco Manufacturing or HCI Hercules Custom Iron.
- B. Material:
 - 1. Steel Bar Stock: ASTM A36.
 - 2. Steel Tubing: ASTM A500, Grade B.
- C. Fabrication:
 - 1. View-blocking 100% Design: Louver Design.
 - 2. Louvers: 1/16-inch thickness overlapping formed sheet metal louvers.
 - 3. Louvers held in place with 3/16-inch round crossbars at 5-3/16 inch centers.
 - 4. Panel banding, framing and mounting per conditions.
 - 5. Electro-forged welded for complete weld penetration of crossbar.
- D. Finish: 20-year Warranty Finish System.
 - 1. Proper preparation including 2 mil etching for proper adhesion.
 - 2. Electrostatic application of epoxy powder primer.
 - 3. Electrostatic application of TGIC polyester powder color coat while metal temperature is 300 degrees F and heat cure for minimum 10 minutes at 400 degrees F.
 - 4. Process to provide minimum 8 mils total coating thickness.
 - 5. Color to be selected from manufacturer's standard selection.
- E. Gate:

1. Install gate leafs on post hinge pins; minimum three.
 2. Provide gate with deadbolt locking provided in fabrication of gate, prepared to receive cylinder specified under Section 08 71 00.
 3. Check for proper function.
 4. Posts: ASTM A500, Grade B steel tubing.
- F. Mounting as indicated on Drawings.

2.18 FINISHES - STEEL AND IRON

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2.19 FINISHES - ALUMINUM

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class I Natural Anodized Finish (unless indicated otherwise): AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.20 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 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 SETTING LOOSE PLATES

- A. Clean concrete bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use nonshrink, nonmetallic grout, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05 51 00 - METAL STAIRS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- C. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Include the design engineer's stamp or seal on each sheet of shop drawings.
- C. Delegated Design Data: As required by authorities having jurisdiction.
- D. LEED Submittals: Comply with Section 018113.
 - 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.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- E. Welders' Certificates.

1.5 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State of Maryland, 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.

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. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
 3. Dimensions: As indicated on drawings.
 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 6. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
1. 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.
- 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.

2.2 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- 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. Concrete Reinforcement: None.
 5. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
1. Nosing Depth: Not more than 1-1/2 inch overhang.
 2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
1. Stringer Depth: 12 inches unless greater is indicated on Drawings.
 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Same construction as treads, 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 MATERIALS

- A. Steel Sections: ASTM A 36/A 36M.
- B. 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).
- C. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.
- D. Concrete Reinforcement: Mesh type as detailed, unfinished.

2.4 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.
- 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 51 19 - METAL GRATING STAIRS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes industrial-type, straight-run stairs with steel-grating treads and railings attached to metal grating stairs.

1.2 ACTION SUBMITTALS

- A. Product Data: For metal grating stairs.
- B. LEED Submittals: Comply with Section 018113.
 - 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.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments.
- D. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 - 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm)
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
- C. Structural Performance of Railings: Railings must withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m)
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- E. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).
- F. Cast-Abrasive Nosings: Cast iron, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both.
- G. Tubing: ASTM A 500 (cold formed).
- H. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- I. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- J. Galvanizing: In accordance with requirements of ASTM A 123/A 123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.3 FASTENERS

- A. Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Post-Installed Anchors: Chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.

5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- C. Fabricate joints that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 1. Fabricate stringers of steel channels.
 - a. Provide closures for exposed ends of channel stringers.
 2. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
 1. Fabricate treads and platforms from pressure-locked steel grating with openings in gratings no more than 5/16 inch (8 mm) in least dimension.
 2. Surface: Plain.
 3. Finish: Galvanized.
 4. Fabricate grating treads with cast-abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

2.7 STAIR RAILINGS

- A. Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion. Repair galvanize finish for railings.
- B. Form changes in direction as follows:
 1. By bending.
- C. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- D. Close exposed ends of railing members with prefabricated end fittings.
- E. Finish: Galvanized.

2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 05 52 13 - PIPE AND TUBE RAILINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Wall mounted handrails.
- B. Stair railings and guardrails.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.
- C. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- D. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.3 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- D. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2015.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- G. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2007.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Non-welded field connections in aluminum handrails to be limited to greatest fabricated section lengths; locations accepted by Architect and consistent for multiple locations.
- C. LEED Submittals: Comply with Section 018113.
 - 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.
 - b. For regionally sourced recycled content metal: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

1.5 QUALITY ASSURANCE

- A. Mock-up: Build mock-up section of guardrail with attached handrail to demonstrate aesthetic effects and set quality standards for fabrication and erection.

1. Size: 42 inches high x 48 inches wide.

PART 2 PRODUCTS

2.1 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. Design railing assembly, wall rails, and attachments to resist lateral force of 75 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for configurations and heights.
 1. Infill: Round vertical pickets; size and spacing indicated on drawings.
- E. 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.
 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 3. For anchorage to stud walls, provide backing plates, for bolting anchors.
- F. 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.

2.2 STAINLESS STEEL RAILING SYSTEM

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
- E. Bars and Shapes: ASTM A 276, Type 304.

2.3 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A 500, 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. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

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. Close exposed ends of railing members with prefabricated end fittings.
- E. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
 - 2. Wall brackets for aluminum railing may be cast aluminum or stainless steel; wall brackets for aluminum rails connecting to steel guardrail systems must be stainless steel and also used for wall-mounted handrails in same area.
- G. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- H. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- I. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by continuous welds.
 - 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.
 - 4. Select proper welding method to result in consistent finish with final finish.
- J. Stainless Steel Handrail Field Joints:
 - 1. Fabricate sleeves for tight press fit; keep sleeves round.
 - 2. Cut handrail ends square and to accurate length to assure smooth, tight joints.
 - 3. Fasteners: Type 304 stainless-steel tamper-resistant flat head fasteners.

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. Anchor railings securely to structure.

- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Handrail Field Joints:
 - 1. Clean area to be joined thoroughly.
 - 2. Apply epoxy adhesive to inside of pipe.
 - 3. Insert sleeve and fit components together, wipe excessive adhesive.
 - 4. Provide stainless steel set screws concealed on underside of handrail; fill head with epoxy setting adhesive and clean excess.

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 05 53 20 - STAIR NOSINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Extruded aluminum stair nosings at exterior locations.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturers product specifications, installation and maintenance instructions.
- C. Samples for initial selection, in the form of manufacturer's color charts or sections of units showing the full range of colors.
- D. Samples for verification, in the form of sections of units in manufacturer's standard sizes; prepare samples from same material to be used for the Work.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain stair nosings from one source and from a single manufacturer.

1.4 SEQUENCING AND SCHEDULING

- A. Coordinate with metal stairs so that nosing sub-bases are available for placing integrally with metal pan stair fill.

PART 2 PRODUCTS**2.1 EXTRUDED ABRASIVE NOSINGS**

- A. Provide extruded aluminum units with abrasive filler consisting of aluminum oxide or silicon carbide grits, or a combination of both, in an epoxy-resin binder. Furnish in lengths as required to accurately fit each opening or conditions.
 - 1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above the aluminum extrusion and having the maximum recycled content feasible.
 - a. Primary Color: To be selected.
 - b. Highlight Color: Contrasting; to be selected.
 - 2. Provide two-piece design. Sub-channel to be set with stair pan fill (use plywood filler for tread).
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. American Safety Tread Co., Inc.; TP-311 Ribbed
 - 2. Babcock Davis; Model P3.375E
 - 3. Balco/Metalines, Inc.; DST-330
 - 4. Wooster Products, Inc.; WP-RN3SG
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.
- D. Drill for mechanical anchors with countersunk holes located not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by the manufacturer.
- E. Set elevation of sub-channel and concrete fill levels to provide flush installation to top of finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Furnish sub-channel to exterior concrete step installer for installation at appropriate time.

3.2 INSTALLATION

- A. Install stair nosings in accordance with manufacturer's instructions.
- B. Install sub-channel with concrete fill.
- C. Install tread insert prior to Substantial Completion and protect from damage until acceptance; set insert in sealant applied to sub-channel and clean any sealant seeping from joint following installation of insert.
- D. Work shall be aligned plumb, level, and, where required, flush with adjacent surfaces and rigidly anchored to the substrate.
- E. Clean exposed surfaces as recommended by the manufacturer.

END OF SECTION

SECTION 05 58 13 - COLUMN COVERS**PART 1 GENERAL****1.1 This Section includes:**

- A. Decorative column covers.

1.2 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. Shop Drawings:
 - 1. Shop drawings shall show dimensions, sizes, thickness, alloy(s), temper(s), finishes, joint(s), attachments and the relationship of adjoining work.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, which depict actual product, color, and patterns.
- E. Certification:
 - 1. Submit certificates from column cover manufacturer attesting that products comply with specified requirements, including finish as specified.
 - 2. Submit list of projects completed. Projects listed shall be of similar type, scope and size, and shall have all necessary contact information for verification by the owner or Architect of Record.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Single manufacturer with a minimum of ten projects of similar size and scope in the past five years shall manufacture, fabricate and deliver column covers and all primary products specified in this section.
- B. Installer / Fabricator Qualifications: Fabricator shall have a minimum of five years experience installing systems of similar type and scope as those specified in this section.
 - 1. Fabricator must own and operate facilities capable of creating and finishing all metal components.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect all materials during fabrication, shipment, site storage and erection to prevent damage to the finished work from other trades.
- B. Store column covers inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures and humidity.
- C. Store and dispose solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT 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.

1.6 WARRANTY

- A. Upon project close-out, provide Owner with a copy of the manufacturers standard one (1) year limited warranty against manufacturing defect on the column covers.
- B. Warranty on Column Cover Finishes may be extended up to a maximum of twenty-five (25) years following date of substantial completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 1. C/S Group.
 - 2. Fry Reglet Architectural Metals.
 - 3. Gordon.
 - 4. Metalwerks.
 - 5. Nelson Industrial Inc.
 - 6. Pittcon.

2.2 MATERIALS

- A. All secondary mounting posts, anchors, clips and fasteners are to be provided as a complete package of this work.
- B. No exposed fasteners for metal closures are allowed.
- C. Aluminum:
 - 1. Minimum 0.090 inch thickness.
 - 2. Finish: Fluoropolymer coating containing minimum 70 percent Kynar resin or epoxy powder coat finish; match Architect's sample for color.

2.3 FABRICATION

- A. Design:
 - 1. Column covers shall have a closed vertical joint
 - 2. Provide recessed base and ceiling details including curved trim for ceiling support.
 - 3. Provide horizontal reveal 2'-8" above finished floor.
- B. Column cover shall be manufactured true to round geometry as shown on plan view of architectural drawings with a tolerance of +/- 1/16 inch (1.5mm).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install column cover in accordance with manufacturer's written installation instructions and shop drawings.
- B. Column cover shall be erected plumb, level, square, true to line, securely anchored, and in proper alignment and relationship to work of other trades.
- C. Column cover shall be inspected before installation to be free from dents, scratches and other defects.

3.2 CLEANING

- A. Removal of protective covering shall occur immediately after installation to prevent adhesive transfer.
- B. Clean all surfaces following installation.
- C. Maintenance per manufacturer's finish maintenance instructions.

3.3 PROTECTION

- A. Protection of column covers from damage by other trades after installation. Protection to remain in place until directed by Architect.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Sheathing.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Miscellaneous framing and sheathing.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.2 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- F. PS 20 - American Softwood Lumber Standard; 2010.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. LEED Submittals: Comply with Section 018113.
 - 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 CoC.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For treated wood, if available: Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood installed within the building interior: Documentation indicating no added formaldehyde resins or compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM) for ultra-low-emitting formaldehyde (ULEF) resins or.

1.4 QUALITY ASSURANCE

- A. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body.

1.5 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. 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.
 - 2. 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.
- B. Lumber fabricated from old growth timber is not permitted.
- C. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body.
- D. Regional Materials: Give preference to wood manufactured and harvested within 100 mile radius of Project Site.
- E. Factory mark each piece of lumber with grade stamp of grading agency.
- F. Use Exterior type for exterior locations and where indicated. For all roof and parapet blocking (to include plywood where utilized) provide exterior fire treated product.
 - 1. Basis-of-Design: Hoover Exterior Fire-X.
- G. Interior wet-applied adhesives, sealants, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- H. Composite wood installed within the building interior: Contain no added formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. 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. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
 - 1. Bond Classification: Exterior.

2. Span Rating: Refer to conditions on Drawings and delegated design shop drawings..
 3. Performance Category: 5/8 PERF CAT.
- B. 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 per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.5 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
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 AWWA standards.
- B. Fire Retardant Treatment:
1. Exterior Type: AWWA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating 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.
 - d. Treat wood blocking installed in built-up thickness for roofing terminations except top layer in direct contact with roofing membrane.
 2. Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating 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 Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 2. Treat lumber in contact with roofing, flashing, or waterproofing.
 3. Treat lumber in contact with masonry or concrete.
 4. Treat lumber less than 18 inches above grade.

5. Treat lumber in other locations as indicated.
6. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.
 - d. Treat plywood less than 18 inches above grade.
 - e. Treat plywood in other locations as indicated.
- D. Preservative Pressure Treatment of Lumber in Contact with Soil: AWP A U1, Use Category UC4A, Commodity Specification A using waterborne preservative to 0.4 lb/cu ft retention.
 1. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 1. Screw panels to framing.
- 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.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Finish carpentry items.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- D. AWPAC C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.
- E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on fire retardant treatment materials and application instructions.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.
- D. Samples: Submit two samples of finish plywood, 24 inches x 24 inch in size illustrating wood grain and specified finish.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 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, plastic laminate, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 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

Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- C. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum three years of documented experience.
- D. Mockup: Build a mockup panel with samples of exposed trim, for this Project, applied to demonstrate treatment of fasteners and joints between trim sections.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire retardant requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.

1.7 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.
- B. 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.
- C. Recycled Content: Provide particleboard and MDF with minimum 80 percent recycled content.
- D. Composite wood installed within the building interior: Comply 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.

2.2 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.3 LUMBER MATERIALS

- A. Hardwood Lumber: Maple species, plain sawn, maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.4 SHEET MATERIALS

- A. Hardwood Plywood: HPVA HP-1, Grade AA, Type II; Veneer core, type of glue recommended for application; Maple face species, rotary cut.

2.5 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3, HGS; color as selected; textured, low gloss finish .
- B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.

2.6 ADHESIVE

- A. Adhesive: Type recommended by laminate manufacturer to suit application .
 - 1. Interior wet-applied adhesives: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.7 ACCESSORIES

- A. Wood Filler: Solvent base, tinted to match surface finish color.

2.8 WOOD TREATMENT

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- B. Wood Preservative by Pressure Treatment (PT Type): AWWPA Treatment C2 using water borne preservative with 0.25 percent retainage.
- C. Provide identification on fire retardant treated material.
- D. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
- E. Redry wood after pressure treatment to maximum 19 percent moisture content.

2.9 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.
- C. Cap exposed plastic laminate finish edges with 3mm polyvinylchloride (PVC), machine applied with hot melt adhesive, inside/outside length radiused, corner radiused and buffed.
 - 1. Color selection for PVC edging will be made at a later date; Architect reserves the right to select colors manufactured and offered by Woodtape Edge Banding (at no additional cost to the Owner), when a standard selection offered by the casework manufacturer does not provide a suitable color in the Architect's opinion.
- D. Shop prepare and identify components for book match grain matching during site erection.
- E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- F. 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.
- G. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

2.10 SHOP FINISHING

- A. Apply wood filler in exposed nail and screw indentations.
- B. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

- C. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
 - 1. Transparent: Conversion varnish (formerly TR-4).
 - 2. Opaque: Catalyzed polyurethane (formerly OP-6).
- D. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3 TOLERANCES

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

END OF SECTION

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Cabinet hardware.
- C. Factory finishing.

1.2 DEFINITIONS

- A. Work of this Section is typically referred as "Millwork" on the Drawings.

1.3 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- E. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004 (ANSI/HPVA HP-1).
- G. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- H. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2007.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
- F. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 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, plastic laminate, if available: Material Ingredient Report.
- 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 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 Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

1.5 QUALITY ASSURANCE

- A. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated as follows:
 - 1. Reception Cabinets: Premium quality.
 - 2. Other Cabinets: Custom quality.
- B. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and familiar with the AWI/AWMAC QSI.
- C. Quality Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI/AWMAC Quality Certification Program.

1.6 PRE-INSTALLATION MEETING

- A. Convene not less than one week before starting work of this section.

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 Premium Grade.

2.2 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. 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.

- C. Composite wood installed within the building interior: Comply 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 LUMBER MATERIALS

- A. Hardwood Lumber: NHLA; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as follows:
 - 1. Exposed Surfaces: Species Maple.

2.4 PANEL MATERIALS

- A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of particleboard, medium density fiberboard, strawboard, or engineered combination of core materials listed; type of glue recommended for specific application; thickness as required; face veneer as follows:
 - 1. Exposed Surfaces: Grade AA, Maple, rotary cut, book-matched.
- B. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on drawings.
 - 1. Density: 47-pound density or as required by the referenced standard, whichever is the more stringent.
 - 2. Recycled Content: Provide minimum 80 percent recycled content.
- C. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
 - 1. Use as backing for plastic laminate unless otherwise indicated.
 - 2. Recycled Content: Provide minimum 80 percent recycled content.
- D. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.
- E. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.
- F. Composite Wood, Agrifiber products and Laminating Adhesives: No added urea formaldehyde.

2.5 LAMINATE MATERIALS

- A. Manufacturers:
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
 - 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, .
 - 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, .
 - 3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, .
 - 4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in solid colors, wood grains, and patterns, in matte finish.
2. Ten different colors may be selected by Architect for this Project.

2.6 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
 1. Interior wet-applied adhesives: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Edges:
 1. Cabinet body leading edges and drawer box edging shall be flat edge 0.020 inch (0.51mm) polyvinylchloride (PVC), machine applied with hot melt adhesive.
 2. Doors and drawer edges and front and rear shelf edges shall be edged with 3mm polyvinylchloride (PVC), machine applied with hot melt adhesive, inside/outside length radiused, corner radiused and buffed.
 3. Color selection for PVC edging will be made at a later date; Architect reserves the right to select colors manufactured and offered by Woodtape Edge Banding (at no additional cost to the Owner), when a standard selection offered by the casework manufacturer does not provide a suitable color in the Architect's opinion.
- C. Fasteners: Size and type to suit application.
- D. 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.
- E. Grommets for Cable Passage through Countertops: 2-1/2 inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 1. Product: Subject to compliance with requirements, provide "EDP series" by Doug Mockett and Co., Inc.
 2. Coordinate color with countertop; provide white with white countertops; black color elsewhere.

2.7 HARDWARE

- A. Hardware Standard: Hinges, pulls, catches, drawer slides, locks and latches for millwork cabinetry, to be match to hardware included under Division 12 casework section; hardware finishes to match hardware included under the Division 12 casework section.
- B. Piano Hinges:
 1. Material: Steel; polished nickel finish.
 2. Open Width: 2 inches.
 3. Gage: Minimum 0.04 inch.
 4. Pin Diameter: Minimum 0.09 inch.
 5. Basis-of-Design product Model 351.09.643 by Hafele.
- C. Surface-mounted "Rakks" Counter Brackets: L-shaped bracket fabricated from aluminum T sections; Model No. EH-1818 and EH-1824 as manufactured by Rangine Corporation.
 1. Load capacity per bracket: 450 pounds.
 2. Finish: Custom powder paint coating.
 3. Provide with 5/8 inch opening rubber grommet installed in 7/8 inch hole.
- D. Coat Hooks:
 1. Basis-of-Design: Model K-21 Series by Magnuson Group, Inc.; Model 980 by Datum; Model A19 by EMCO Specialty Products Inc., or comparable product.

2. Height: Approximately 6 inches.
 3. Depth: Approximately 3 inches.
 4. Width: 3/4 inch.
 5. Finish: Anodized aluminum.
- E. Cubbie Hooks and Student Use Hooks:
1. Basis-of-Design: HEWI Nylon Double Coat Hook 842.84.099 or equal Comparable Product.
 2. Construction: Nylon coated metal.
 3. Color: To be selected from manufacturers available blue or gray colors.

2.8 FABRICATION

- A. Cabinet Style: Flush overlay.
- B. Cabinet Doors and Drawer Fronts: Flush style.
- C. Drawer Construction Technique: Dovetail joints.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- G. 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. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 2. Cap exposed plastic laminate finish edges with polyvinylchloride (PVC), machine applied with hot melt adhesive.

2.9 FACTORY FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
- C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1500, As scheduled.
- E. Match materials and finish of adjacent panels or frame when providing fillers in the final installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.

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. Secure cabinets to floor using appropriate angles and anchorages.

3.3 ADJUSTING

- A. Adjust installed work.

3.4 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 13 00 - SHEET WATERPROOFING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Sheet membrane waterproofing.
- B. Accessories.
- C. Drainage panels.

1.2 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).
- B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane.
- C. LEED Submittals: Comply with Section 018113.
- D. MR Credit 4: BPDO - Material Ingredients
 - 1. For waterproofing, if applicable: Material Ingredient Report.
- E. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- F. Certificate: Certify that products meet or exceed specified requirements.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.
- C. 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 MANUFACTURERS

- A. Carlisle Coatings & Waterproofing Inc.; Product CCW MiraDRI 860/861.
- B. GCP Advanced Technologies Construction Products; Bituthene 3000/Low Temperature or Bituthene 4000.
- C. Henry Company; Blueskin WP 100/200.
- D. Polyguard Products, Inc.; Polyguard 650.
- E. Soprema; Colphene 3000.
- F. W. R. Meadows; MEL-ROL.

2.2 APPLICATIONS

- A. Waterproof for building surfaces:
 - 1. Exterior face of foundation/building walls where finished grade is above finished floor elevation; waterproofing installed from top of footing to finished grade elevation.
 - 2. Concealed vertical face of separation of stepped floor elevations.

2.3 MEMBRANE MATERIALS

- A. Composite Laminate Membrane: Comprised of 56 mils thickness of rubberized asphalt and a 4 mils thickness of polyethylene film with release liner on adhesive-side; 60 mils total thickness.
 - 1. Tensile Strength: 325 psi, measured in accordance with ASTM D 412.
 - 2. Water Absorption: 231 percent increase in weight, maximum, measured in accordance with ASTM D 570, 24 hour immersion.
 - 3. Water Vapor Permeability: 0.05 perm inch, measured in accordance with ASTM E 96/E 96M.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Sealant: As recommended by membrane manufacturer.
- D. Termination Bars: Aluminum; compatible with membrane and adhesives.

2.4 ACCESSORIES

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.

- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- E. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION - MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.
- G. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.
- H. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.4 INSTALLATION - DRAINAGE PANEL

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION

SECTION 07 16 16 - CRYSTALLINE WATERPROOFING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Crystalline waterproofing.

1.2 REFERENCE STANDARDS

- A. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Test data showing hydraulic permeability.
 - 2. Details for waterproofing at joints, intersections, and other special conditions.
- B. Specimen warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of products of the type specified and providing technical representatives to visit project site.
- B. Installer Qualifications: Acceptable to manufacturer, with documented experience on at least 5 projects of similar nature within the last 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Take necessary precautions to keep cementitious materials dry.

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.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide installer's warranty agreeing to correct leaking waterproofing for 2 years from the Date of Substantial Completion, unless leakage is caused by structural failure, movement of the structure, or other causes beyond the installer's control.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Crystalline Waterproofing:
 - 1. Anti-Hydro International, Inc.; Hydro Cap.
 - 2. Conproco Corp.; Super Seal.
 - 3. Tamms Industries, Inc.; Hey'Di K-11.
 - 4. ThoRoc, Div. of ChemRex; Tegraproof.
 - 5. Tremco Incorporated; Permaquik Crystalline Waterproofing.
 - 6. Xypex Chemical Corporation; Xypex.

2.2 APPLICATIONS

- A. Waterproofing for building surfaces:
 - 1. Inside of elevator pits.

2.3 MATERIALS

- A. Crystalline Waterproofing: Portland cement and chemical compound that when applied to the surface of concrete forms insoluble crystals in the capillary pores preventing the passage of liquids, while having no adverse effect on the normal properties of concrete.
 - 1. Hydraulic Permeability: No measurable leakage or water flow at 200 psi pressure when tested in accordance with COE CRD-C 48, using minimum 2 inch thick sample and 20 days duration.
 - 2. Toxicity: Non-toxic.
 - 3. Color: Gray.
- B. Patching Compound: Ready-mixed cementitious mortar recommended or approved by waterproofing manufacturer.

PART 3 EXECUTION

3.1 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. Use sand blasting, water blasting, or acid etching as recommended.
- C. Plug water leaks.
- D. Patch holes, construction joints, and cracks. Remove defective concrete.
- E. Obtain approval of manufacturer's field representative before beginning installation.

3.2 INSTALLATION

- A. Install in strict accordance with manufacturer's instructions. Maintain environmental conditions required and recommended by manufacturer. Keep a copy of manufacturer's instructions on site.
- B. Coordinate installation with installation of products that must penetrate waterproofed surfaces.
- C. Prevent excessive drying of surface.
 - 1. Cure waterproofing for at least 3 days, or length of time required by manufacturer, with water spray and adequate air circulation.
 - 2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.
- D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

END OF SECTION

SECTION 07 18 00 - TRAFFIC COATINGS**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes traffic coatings for the interior mechanical spaces as noted on the finish schedule.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. LEED Submittals: Comply with Section 018113.
1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- C. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
- D. Samples for Initial Selection: For each type of finish indicated.
- E. Qualification Data: For Installer.
- F. Material Test Reports: For each traffic coating.
- G. Material Certificates: For each traffic coating, signed by manufacturers.
- H. Field quality-control test reports.
- I. Maintenance Data: For traffic coatings to include in maintenance manuals. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.
- J. Warranty: Special warranty specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

- A. Base Membrane: VOC compliant, high adhesion, liquid polyurethane membrane and shall meet or exceed the following typical performance properties:

Property	Typical Value	ASTM Method
1. Composition	Aromatic Urethane	
2. Solids by Weight	85%	C 1250
3. Hardness, Shore A	63	D 2240
4. Tensile Strength	850 PSI	D 412
5. Ultimate Elongation	625%	D 412
6. Tear Resistance	140 lb/in	D 624
7. Adhesion to Concrete	23 PLI	D 903
8. Low Temp. Flexibility	-650F	D 522

- B. Traffic-Resistant Top Coat: VOC compliant, high tensile strength, abrasion-resistant and weather-resistant aliphatic elastomeric polyurethane and shall meet or exceed the following typical performance properties:

Property	Typical Value	ASTM Method
1. Composition	Aliphatic Urethane	
2. Solids by Weight	72%	C 1250
3. Hardness, Shore A	91	D 2240

4.	Tensile Strength	3200 PSI	D 412
5.	Ultimate Elongation	190%	D 412
6.	Tear Resistance, Die C	300 lb/in.	D 624
7.	Low Temp. Flexibility And Crack Bridging	Pass	C 957
8.	Weather Resistance	No Chalking at 2000 hrs.	G 53
9.	Water Permeability (system)	< 1.0 Perm	E 96 B
10.	Abrasion Resistance (system)	< 50 mg.	C 501

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of traffic coatings required for this Project.
- B. Source Limitations:
 - 1. Obtain traffic coatings from a single manufacturer.
 - 2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.
- C. Preinstallation Conference:
 - 1. Before installing traffic coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, Owner, Architect, consultants, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
 - 1. Manufacturer's brand name.
 - 2. Type of material.
 - 3. Directions for storage.
 - 4. Date of manufacture and shelf life.
 - 5. Lot or batch number.
 - 6. Mixing and application instructions.
 - 7. Color.
- B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
- B. Do not install traffic coating until items that will penetrate membrane have been installed.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period.

Warranty does not include deterioration or failure of traffic coating due to unusual phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or abuse by maintenance equipment.

1. Deterioration of traffic coatings includes the following:
 - a. Adhesive or cohesive failures.
 - b. Abrasion or tearing failures.
 - c. Surface crazing or spalling.
 - d. Intrusion of water, oils, gasoline, grease, or acids into deck substrate.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Traffic Coatings: Complying with ASTM C 957.
- B. Material Compatibility: Provide primers; base, intermediate, and topcoats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- C. Interior wet-applied traffic coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.2 TRAFFIC COATING

- A. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 1. BASF Construction Chemicals, LLC - Building Systems; Product Conipur II: www.BuildingSystems.BASF.com.
 2. Neogard; Division of Jones-Blair; Product AUTO-GARD: www.neogard.com.
 3. Tremco Incorporated; an RPM company; Product Vulkem 350NF/950NF/951NF: www.tremcosealants.com.
- B. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.
 1. Material: Urethane.
- C. Preparatory and Base Coats: Single- or multicomponent, aromatic liquid urethane elastomer.
- D. Topcoat: Single- or multicomponent, aliphatic liquid urethane elastomer.
 1. Color: As selected by Architect from manufacturer's full range.
- E. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):
 1. Base Coat: 32 mils minimum wet film thickness.
 2. Top Coat: 16 mils minimum wet film thickness.
- F. Aggregate: Uniformly graded, washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.
 1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:
 - a. Top Coat: 8 to 10 lb/100 sq. ft., follow with backroll to encapsulate the sand.

2.3 MISCELLANEOUS MATERIALS

- A. Joint Sealants: As specified in Division 7 Section "Joint Sealants."
- B. Sheet Flashing: Nonstaining.

1. Minimum Thickness: 60 mils thickness.
2. Material: Sheet material recommended in writing by traffic coating manufacturer.
- C. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.
- D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify compatibility with and suitability of substrates.
 3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
 4. Verify that substrates are visibly dry and free of moisture.
 - a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.
 - b. Test for moisture content by method recommended in writing by manufacturer.
 5. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Clean and prepare substrates according to ASTM C 1127 and manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.
- B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.
- C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.
 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
 2. Remove concrete fins, ridges, and other projections.
 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.
- B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.
- C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

3.5 TRAFFIC COATING APPLICATION

- A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.
 - 1. Start traffic coating application in presence of manufacturer's technical representative.
 - 2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.
- B. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated, and omit aggregate on vertical surfaces.
- C. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified testing agency to perform the following field tests and inspections and prepare test reports:
 - 1. Testing agency shall verify thickness of coatings during traffic coating application.
 - 2. If test results show traffic coating materials do not comply with requirements, prepare surfaces and reapply traffic coatings.
- B. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

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

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Board insulation at perimeter foundation wall and underside of floor slabs.
- B. Batt insulation in exterior wall construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For insulation: Industry-wide or product-specific EPD.
 - 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 v1.1-2010 and VOC content in g/L.
 - b. For batt insulation installed within the building interior: Documentation indicating that products do not contain added urea formaldehyde, phenol formaldehyde, or urea-extended phenol formaldehyde.

1.4 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 Under Concrete Slabs: Extruded polystyrene board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene board.
- C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.2 GENERAL

- A. Recycled Content: Provide mineral wool insulation with minimum 75 percent recycled content; provide polystyrene insulation with minimum 20 percent recycled content; provide glass fiber insulation with minimum 20 percent recycled content.
- B. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.3 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type X and Type VI; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Board Edges: Square.
 - 4. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
 - 5. Compressive Resistance: 15 psi at vertical applications; 40 psi at foundation perimeter.
 - 6. Board Density: 1.3 lb/cu ft.
 - 7. Water Absorption, maximum: 0.3 percent, volume.
 - 8. Manufacturers:
 - a. Dow Chemical Co: www.dow.com.
 - b. Owens Corning Corp: www.owenscorning.com.
 - c. Pactiv Building Products: greenguard.pactiv.com/#sle.
- B. Adhesive: Provide letters from the insulation manufacturer and vapor retarder manufacturer confirming compatibility of adhesive recommended by insulation manufacturer for applying cavity insulation.

2.4 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E 136, except for facing, if any.
 - 4. Manufacturers:
 - a. CertainTeed Corporation: www.certainteed.com.
 - b. Johns Manville Corporation: www.jm.com.
 - c. Knauf Insulation: www.knaufusa.com
 - d. Owens Corning Corp: www.owenscorning.com.
- B. Unfaced Batt Insulation: ASTM C 665, Type I.
- C. Batt insulation installed within the building interior: Do not contain added urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.

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 .

- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Apply adhesive to back of boards:
 - 1. Three continuous beads per board length.
- B. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.4 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof 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.

3.5 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 27 - ENCLOSED CAVITY FOAMED INSULATION**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Foamed-in-place insulation in masonry cavity walls.
- B. Transition Membranes.
- C. Flexible Flashing.

1.2 REFERENCES

- A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- B. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- C. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- D. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- G. ASTM E 2357 - Standard for Air Barrier Materials.
- H. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory test Apparatus.

1.3 SUBMITTALS

- A. Product Data: Provide product description, insulation properties, and preparation requirements.
- B. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- C. ICC-ES Evaluation Report to establish code compliance and R-Value.
- D. Submit proof of compliance with NFPA 285 for Masonry as well as Rain Screen wall assemblies if applicable.
- E. Submit certification of ASTM E-2357 compliance.
- F. Submit proof of ABAA- Assembly Testing and Letter from Manufacturer stating SPF contractor in Approved to install Air Barrier SPF Product.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For insulation, if available: Material Ingredient Report.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied primers, sealers, adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years of experience.
- C. Contractor shall be certified by ABAA for SPF air barrier systems. Contractor shall include ABAA inspection and reports, submitted to Architect at each stage.
- D. Contractor shall provide a written Safety Program, written Respirator Program and a written Job Hazard Analysis.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke limitations.

1.6 MOCK-UP

- A. Include within mock-up for masonry assemblies.

1.7 PRE-INSTALLATION MEETING

- A. Convene prior to mock-up and three weeks prior to commencing Work of this section. Review non-standard details, unusual conditions, and quality control procedures for this project.
 - 1. The following be in attendance: SPF Contractor, General Contractor, Sheathing and or Masonry Contractors, Owner's representative and Architect.

1.8 FIELD CONDITIONS

- A. Do not install insulation when ambient temperature is lower than 40 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Permax 2.0 by Henry Company.
- B. Ecobay CC by Bayer Materials Sciences.
- C. Walltite by BASF.
- D. Corbond III by Johns Manville Company.

2.2 MATERIALS

- A. Insulation: Polyurethane type.
 - 1. Thermal Conductivity: When tested in accordance with ASTM C 518:
 - 2. Water Vapor Transmission: 1.82 perms (1 inch SPF), measured in accordance with ASTM E 96.
 - 3. Air Permeance: 0.000025 L/s/sq. m. at 75 Pa, when tested in accordance with ASTM E 2178.
 - 4. Compressive Strength: 22 psi, when tested in accordance with ASTM D 1621.
 - 5. Density: 2.0 lb/cu ft, when tested in accordance with ASTM D 1622.
 - 6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25 / 350, when tested in accordance with ASTM E 84 (4 inches SPF thickness).
 - 7. R-Value: Minimum of R-16.75.
 - 8. Thickness: 2 1/2 inches.
 - a. Variation from thickness will be no more than plus 1/2 inch and no less than minus 1/4 inch.
- B. Interior wet-applied primer/ sealer: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

- C. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
1. Product:
 - a. York Manufacturing, Inc; Multi-Flash SS: www.yorkmfg.com.
 - b. Mighty-Flash-SA Self Adhering Stainless Steel Fabric Flashing by Hohmann & Barnard, Inc.
 2. Primer: Manufacturers standard product recommended for the application.
 3. Performance Requirements:
 - a. Tensile Strength: ASTM D412 Die; 100,000.
 - b. Puncture Resistance: ASTM E154; minimum 2,500 psi.
 - c. Membrane Thickness: 0.004 in.
 - d. Stainless Steel Thickness: 0.003 in.
 - e. Stainless Steel Type: Type 304.
 4. Accessories (Basis-of-Design):
 - a. Mastic/sealant: Basis-of-Design: York Manufacturing, Inc.; UniverSeal US100.
 - 1) Type: One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50.
 - b. Outside corner and inside corner material; manufacturer's standard available units using:
 - 1) Stainless steel: 26 gauge stainless steel.
 - c. Splice material: Basis-of-Design: York 304 SS by York; manufacturer's standard self-adhered metal material; material matching system material or use Multi-Flash Stainless Steel 6" lap piece and polyether sealant as a splice.
 - d. Termination Bar: Basis-of-Design: York T-96 termination bar; manufacturer's standard 1" composite material bar or a 1" 26 gauge stainless steel termination bar with sealant lip.

2.3 ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Transition Membrane - Compatible with the insulation manufacturer and in locations as detailed in the drawings and at the following:
1. Grade - from face of wall, overlap below grade membrane where applicable.
 2. Parapet - from outside face of wall, over top of parapet and under roof membrane.
 3. Dissimilar materials.
 4. Masonry control joints.
 5. Head, jamb, and sills of windows, doors, and other wall openings.
 6. Basis-of-Design Product: Blueskin SA, Manufactured by Henry.
 - a. Contractor may use flexible flashing material as accepted by insulation manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.2 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

- C. Provide transition membranes between dissimilar materials all instances.

3.3 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Clear foam from masonry veneer anchors to permit free movement within full limit of tie slots.
- D. Patch damaged areas.

3.4 FIELD QUALITY CONTROL

- A. Field inspections and tests to be performed by an independent testing agency. Contractor is to coordinate with and provide full access to Work that the independent testing agency will be inspecting.
- B. Inspection will include verification of insulation and overcoat thickness and density.

END OF SECTION

SECTION 07 27 15 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS**PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Self-adhering, vapor-permeable, nonbituminous sheet air barriers.
 - 2. Locations: Gypsum sheathing locations at metal panels.

1.2 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For sheet air barriers, if available: Material Ingredient Report.
- C. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Mockups: Build mockups to set quality standards for materials and execution.
1. Build integrated mockups of exterior wall assembly as indicated on Drawings or 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

2.3 NONBITUMINOUS SHEET AIR BARRIER

- A. Vapor-Permeable Nonbituminous Sheet: Minimum 20-mil- thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; Fire Resist 705 VP.
 - b. Henry Company; Blueskin VP160.
 - c. VaproShield LLC; RevealShield SA or WrapShield SA.
2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
 - b. Puncture Resistance: Minimum 40 lbf; ASTM E154/E154M.
 - c. Vapor Permeance: Minimum 15 perms; ASTM E96/E96M, Desiccant Method, Procedure A.
 - d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541 as modified by ABAA.
 - e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - f. UV Resistance: Can be exposed to sunlight for 150 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Pecora Corporation.
 - d. Tremco Incorporated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 INSTALLATION

- A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
- B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic.
- C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
 1. Apply sheets in a shingled manner to shed water.
 2. Roll sheets firmly to enhance adhesion to substrate.
- E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

- F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch- wide, transition strip.
- G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
 - 1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- I. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- K. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- L. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- M. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.
- O. Do not cover air barrier until it has been tested and inspected by testing agency.
- P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. 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 (air barrier 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.
- C. Tests: As determined by testing agency from among the following tests:
1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers or ASTM E1186, chamber depressurization using detection liquids.
 2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783.
 3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof.
- D. 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 for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- F. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 07 31 13 - ASPHALT SHINGLES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection, underlayment, and valley protection.
- C. Associated metal flashings and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- C. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016a.
- D. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2016.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- F. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- G. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2017.
- H. NRCA (RM) - The NRCA Roofing Manual; 2018.
- I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating material characteristics.
- C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.
- D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.
- E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- 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. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Shingles: 10 percent of total sq ft of each type and color.

1.4 QUALITY ASSURANCE

- A. Products are Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.

1.5 FIELD CONDITIONS

- A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.
- D. Provide five year manufacturer's warranty for wind damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Asphalt Shingles:
 - 1. Certaineed; Landmark Solaris: www.certaineed.com.
 - 2. GAF; Timberline HD Reflector Series: www.gaf.com.
 - 3. Owens Corning Corp; COOL Roof Collection: www.owenscorning.com.

2.2 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1. Fire Resistance: Class A, complying with ASTM E108.
 - 2. Wind Resistance: Class A, when tested in accordance with ASTM D3161/D3161M.

2.3 SHEET MATERIALS

- A. Eave Protection Membrane:
 - 1. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
- B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type I ("No.15").
- C. Flexible Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.

2.4 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and complying with ASTM F1667.
- B. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.

2.5 METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, and other flashing indicated.
 - 1. Form flashings to profiles indicated on drawings.
 - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

3. Hem exposed edges of flashings minimum 1/4 inch on underside.
 4. Coat concealed surfaces of flashings with bituminous paint.
- B. Aluminum Sheet Metal: Prefinished aluminum, 26 gage, 0.017 inch minimum thickness; PVC coating, coordinate color.
- C. Bituminous Paint: Acid and alkali resistant type; black color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify that roof deck is of sufficient thickness to accept fasteners.
- C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
- D. Verify roof openings are correctly framed.
- E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced ____ inches on center.

3.3 INSTALLATION - EAVE PROTECTION MEMBRANE

- A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

3.4 INSTALLATION - UNDERLAYMENT

- A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, and nail in place.
- B. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.5 INSTALLATION - METAL FLASHING AND ACCESSORIES

- A. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
- C. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.6 INSTALLATION - SHINGLES

- A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.
 1. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

- B. Project first course of shingles 3/4 inch beyond fascia boards.
- C. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- D. Complete installation to provide weather tight service.

END OF SECTION

SECTION 07 42 13 - METAL WALL PANELS**PART 1 GENERAL****1.1 SUMMARY**

- A. Factory-formed and field-assembled, concealed-fastener, lap-seam, profiled metal wall panels.
- B. Factory-formed and field-assembled, concealed-fastener, metal soffit panels.
- C. Factory-formed and field-assembled, exposed-fastener corrugated metal wall panels for parapet back walls.

1.2 DEFINITION

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.
- B. Steel Sheet Thickness: Minimum thickness of base metal without metallic coatings or painted finishes.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft.
- C. Water Penetration: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft.
- D. Wind Loads: International Building Code 2015; Factory Mutual Global and ASCE 7.
- E. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span, unless Code requires greater requirements.
- F. Seismic Performance: International Building Code 2015; and comply with ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads.
- G. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.
- B. Qualification Data: For installer, manufacturer and professional engineer; include 5 copies.
- C. Shop Drawings: Include required sets prepared by or under the supervision of a qualified professional engineer licensed in the State of Maryland, detailing fabrication and assembly of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages,

attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory and field-assembled work.

1. Accessories: Include details of the flashing and trim, at a scale of not less than 1-1/2 inches per 12 inches.
 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 3. Engineer to be employed by the manufacturer and licensed in the State of Maryland.
- D. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:
1. Wall panels and attachments.
 2. Girts or framing.
 3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
- E. Samples for Verification:
1. For each type of exposed finish required.
 2. Metal Wall Panels: Actual panel width; minimum 12 inch length. Include fasteners, closures, and other metal wall panel accessories.
- F. Qualification Data: For installer and Professional Engineer.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
1. Metal Wall Panels: Include reports for air infiltration, water penetration, and structural performance.
- I. LEED Submittals: Comply with Section 018113.
1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For wall panels: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content wall panels: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- J. Maintenance Data: For metal wall panels to include in maintenance manuals.
- K. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Manufacturer Qualifications: Manufacturer capable of providing engineering and field service representation during construction and approving acceptable installer.
1. Engineering Responsibility: Preparation of data for including the following:
 - a. Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Maryland.

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2. Company with a minimum of ten years of continuous experience manufacturing panel material of the type specified and capable of providing the following information.
 3. List of five other projects of similar size, including approximate date of installation and name of Architect for each.
- C. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal wall panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
1. Provide components for installation in mock-ups, as indicated in Section 04 20 00 and the Drawings.
 2. Approval of mockups is for other material and construction qualities specifically approved by Architect in writing.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
- F. Preconstruction Conference: Before starting wall framing, sheathing, or girt construction, conduct conference at Project site. Review methods and procedures related to wall construction and metal wall panels including, but not limited to, the following:
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 7. Review temporary protection requirements for metal wall panel assembly during and after installation.
 8. Review wall panel observation and repair procedures after metal wall panel installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
1. Basis-of-Design Products: The design for each metal wall panel specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified that meet or exceed the performance and aesthetic characteristics of the Basis-of-Design products.

2.2 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 coating designation; structural quality; having recycled content.
 2. Surface: Smooth finish as standard for manufacturer and gage.
 3. Exposed Finishes:
 - a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1) Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat; clear coat finish. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - (a) Locations: All panels except parapet back wall; exposed fastened.
 - 2) Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - (a) Location: Parapet back wall; exposed fastened.
 4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
 5. Recycled Content: Provide steel with minimum 25 percent recycled content.
- B. Panel Sealants:
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 MISCELLANEOUS METAL FRAMING

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653, G60, hot-dip galvanized zinc coating and having recycled content.
- B. Subgirts: Fabricated from minimum 16 gage zinc coated steel conforming to ASTM A 653 SQ Grade 37, G90 coating.

- C. Zee Clips: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.
- D. Base or Sill Channels: 0.079-inch bare steel thickness, cold-formed, galvanized steel sheet.
- E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating.
 - 1. Fasteners for Wall Panels: 300 series stainless steel with 5/8-inch bonded neoprene or EPDM and stainless washers.
 - 2. Concealed fasteners to be cadmium plated carbon steel.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Metal Panel: Uninsulated with 12 inches in coverage width.
 - 1. Basis-of-Design Product - Drawing Designation Metal Panel Type 1: Two profiles to be selected by Architect.
 - a. Morin; Integrity XA-12 (Starter/Base) and X-16 (Field).
 - b. Atas; Rigid Wall II; MFN167 modified to 12-inch coverage (Starter/Base) and MFN160 (Field).
 - c. Centria; Concept Series; CS-220 (Starter/Base) and CS-660 (Field).
 - 2. Basis-of-Design Product - Drawing Designation Metal Panel Type 2:
 - a. Morin; F-12 Smooth.
 - b. Atas; DSF Smooth.
 - c. Centria; IW-10A Smooth.
 - 3. Material: Aluminum-Zinc Alloy-Coated Steel Sheet, ASTM A 792, Class AZ50 coating designation, Grade 40; minimum 20 gage nominal thickness.
 - a. Exterior Facing Finish: 3-coat fluoropolymer.
 - 1) Color: Valspar 439RZ1826M Fluoropon Classic SR Champagne Gold; 430A307 clearcoat.
 - b. Interior Facing Finish: Manufacturer's standard siliconized polyester where unexposed; match exterior facing finish where exposed (equipment screen).

2.6 CONCEALED-FASTENER, METAL SOFFIT PANELS

- A. Metal Soffit Panels, General: Factory-formed, concealed fastener panels with interconnecting side joints, fastened to supports with concealed fasteners, with factory-applied sealant in side laps.

- B. Horizontal Joints: Horizontal joints with drip edge and sloped drain shelf to provide positive water shed away from panel joinery.
- C. Flush-joint profile.
 - 1. Basis-of-Design Product: Same as Metal Panel Type 2.

2.7 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS - PARAPET BACK WALLS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using color-matched fasteners.
- B. Ribbed Profile Metal Wall Panels:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include named manufacturers for other wall panel types.
 - 2. Fluoropolymer (2-coat) finished zinc-coated galvanized sheet; minimum 22 gage.
 - a. Color: To be selected from Valspar Fluoropon line full range of available colors.
 - 3. Panel Coverage: Approximately 36 inches.
 - 4. Panel Height: 3/4 or 7/8 inch.

2.8 ACCESSORIES

- A. Provide components required for a complete metal wall panel assembly including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
- B. Extruded Trim: Manufacturer's complementary aluminum extrusions for head, jamb, sill, base, flush, reveal, inside and outside corner, end wall, and expansion joint details. Finish to match metal wall panels; 2-piece design as represented on Drawings.

2.9 FABRICATION

- A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 - 2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.
- B. Provide factory-fabricated mitered corners; field cut and joined corners will not be accepted.
 - 1. Mitered corner assemblies shall match specified exterior profile panel in shape, general appearance, material and finish.
 - 2. Mitered corner assemblies shall be factory coil coated to match adjacent panels; paint finish shall meet specified warranty requirements.
- C. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.
 1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION, GENERAL

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
 2. Field cutting of metal wall panels by torch is not permitted.
 3. Shim or otherwise plumb substrates receiving metal wall panels.
 4. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction.
 5. Flash and seal metal wall panels with weather closures at eaves and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.

6. Install screw fasteners in predrilled holes.
 7. Locate and space fastenings in uniform vertical and horizontal alignment.
 8. Install flashing and trim as metal wall panel work proceeds.
 9. Provide panel splices with structural support behind each joint. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 10. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 11. Align bottom of metal wall panels and fasten with fasteners as recommended by the metal wall panel manufacturer. Fasten flashings and trim around openings and similar elements with fasteners as recommended by the metal wall panel manufacturer.
 12. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners: Stainless steel.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
1. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealers."
 2. Seal noninsulated metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
- E. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.

3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide

concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Water-Spray Test: After completing the installation of 75-foot length by full height area of metal wall panel assembly, test assembly for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal wall panel installation, including accessories. Report results in writing.
- D. Remove and replace applications of metal wall panels where inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 51 00 - BUILT-UP ASPHALT ROOFING**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. 4-ply built-up asphalt roofing system with aggregate surfacing.
 - 2. Roofing insulation fully adhered to self-adhered air and vapor control membrane.

1.2 SUMMARY

- A. Section Includes:
 - 1. Built-up asphalt roofing with aggregate ballast.
 - 2. Self-adhered air and vapor control membrane
 - 3. Roof insulation.
 - 4. Roof walkways.
- B. Section includes the installation of insulation strips in ribs of acoustical roof deck. Insulation strips are furnished under Division 5 Section "Steel Deck."
- C. Related Sections:
 - 1. Division 7 Section for Metal Roof System
 - 2. Division 7 Section for Metal Wall Panels
 - 3. Division 7 Section for Insulation.
 - 4. Division 7 Section for Sheet Metal Flashing

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to built-up roofing.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed built-up roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Built-up roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by built-up roofing manufacturer based on testing and field experience.
- C. Roofing System must be tested by a third party testing agency and meet ASTM D 2523 for Load Strain Properties of Roof Membrane requirements of MD 586 lbf/in with 2.65% elongation and XMD 474 lbf/in with 2.67% elongation. Report must be submitted as part of the submittals.
- D. FM Approvals Listing: Provide built-up roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a built-up roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.

2. Hail Resistance Rating: SH.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated including roof drains. Data showing the flood coat and gravel meets or exceeds the LEED requirements.
- B. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For insulation, if available: Material Ingredient Report.
- C. Shop Drawings: For built-up roofing. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Base flashings and built-up terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Crickets, saddles, and tapered edge strips, including slopes.
 - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- D. Samples for Verification: For the following products:
 - 1. Built-up roofing materials, including ply sheet, cap sheet and flashing sheet, of color specified.
 - 2. Roof insulation.
 - 3. 3 lb of aggregate surfacing material in gradation indicated.
 - 4. Roof paver, full sized, in each color and texture required.
 - 5. Six insulation fasteners of each type, length, and finish.
 - 6. SRI data for flood coat and gravel and metal roof system.
- E. Qualification Data: For qualified Installer and manufacturer.
- F. Manufacturer Certificates: Signed by roofing manufacturer certifying that built-up roofing complies with requirements specified in "Performance Requirements" Article.
 - 1. Submit evidence of compliance with performance requirements.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of built-up roofing.
- H. Maintenance Data: For built-up roofing to include in maintenance manuals.
- I. Warranties: Sample of special warranties.
- J. Inspection Report: Roofing system manufacturer's inspection report of complete roofing installation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for built-up roofing identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by built-up roofing manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. Contractor will acquire an inspector employed in the roofing industry for minimum of 7 years, experienced in providing inspection services on five similar projects within the past 12 months; with structured training by the manufacturer providing roofing for this project, and authorized by manufacturer to produce periodic inspection reports and decline work not in compliance with warranty requirements and Contract Documents. Periodic inspections shall be performed as required by the manufacturer to provide the specified warranty, or as required by the Architect to review non-conforming work.

- D. Source Limitations: Obtain components including roof insulation, fasteners for built-up roofing from same manufacturer as built-up roofing or approved by built-up roofing manufacturer.
- E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical built-up roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- F. Pre-installation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of built-up roofing, metal wall panel systems and metal roofing systems that fail in materials or workmanship within specified warranty period.
1. Special warranty includes built-up roofing membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and all metal components of built-up roofing, metal wall panels, metal roof system, and coping.
 2. A 25 year NDL, No Dollar Limit, warranty will be provided for the Built-up roof and all components, Metal Roof System, and Metal Wall Panels. The total roof system warranty for all the roofs will be provided by one manufacturer. All roof components of each roofing system will be provided by one manufacturer.
 3. Warranty Period: 25 years from date of Substantial Completion. In years 2, 5, 10, and 15, and 20 Manufacturer will inspect, clean the roof of all debris, and perform any necessary maintenance. A report with photographs will be generated explaining the roof inspection, what was found and debris that was removed from the roof, and the maintenance that was performed.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of built-up roofing such as built-up roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 BUILT-UP ROOFING MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide all products by one of the following:
1. Tremco, Incorporated.
 2. Johns Manville.
 3. Firestone Building Products.
 4. Or Approved Equal.

2.2 ROOFING MEMBRANE PLIES

- A. Base Ply Sheet: Tremco, BURmastic Composite Ply Supreme: Or APPROVED EQUAL Nonperforated, asphalt-coated, polyester/fiberglass/polyester reinforced sheet dusted with fine mineral surfacing on both sides which meets the requirements of ASTM D 4601, Type II, and the following properties:
1. Tensile Strength, minimum, ASTM D 5147: machine direction, 303 lbf/in; cross machine direction, 287 lbf/in.
 2. Tear Strength, minimum, ASTM D 5147: machine direction, 480 lbf; cross machine direction, 458 lbf.
 3. Pliability, 1/2 inch radius bend, ASTM D 146: No failures.
 4. Thickness, minimum, ASTM D 146: 0.067 inch.
 5. Weight, minimum, ASTM D 228: 37 lb/100 sq. ft.
 6. Mass of desaturated polyester/glass/polyester mat, ASTM D 228: 2.2 lb/100 sq. ft.
 7. Asphalt, minimum, ASTM D 228: 10 lb/100 sq. ft.

- B. Ply Sheet: ASTM D 2178, Type VI, asphalt-impregnated, glass-fiber felt.

2.3 BASE FLASHING SHEET MATERIALS

- A. TPA Elastomeric Sheeting.
1. Elastomeric sheeting compounded from Elvaloy, CPE, and PVC, elastomer laminated to high strength polyester reinforcing scrim and meets the requirements of ASTM D 5019, Type IV, TPA sheet.
 2. Thickness: .045 inch.
- B. TPA Flashing Adhesive.
1. Solvent-Free Elastomeric Roofing Mastic: One-part, solvent-free, asbestos-free, low-odor elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings. No Bonding Adhesive or Solvent Free Bonding Adhesive can be used.
 2. Horizontal stripping adhesive for flashing to roof membrane will be white reflective flood coat and reinforcing mesh in a three course application.
- C. Contractor Option - Liquid Flashing Materials: For flashing detail locations where liquid flashing is appropriate and subject to Architect approval, the Contractor may choose to provide the reinforced liquid flashing system offered by the roofing membrane manufacturer; selection of this option does not change warranty requirements.
1. Basis-of-Design: Tremco Inc.; AlphaGuard system.

2.4 ASPHALT MATERIALS

- A. Asphalt Primer: ASTM D 41.
- B. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by built-up roofing manufacturer for application. Asphalt must have the "no smell" additive. No kettles can be used only Asphalt Tankers

2.5 AUXILIARY BUILT-UP ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing manufacturer for application.
- C. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening built-up roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.
- E. Metal Flashing Sheet: Metal flashing sheet is specified in Division 7 Section "Sheet Metal Flashing and Trim."
- F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by built-up roofing manufacturer.

2.6 INSULATION MATERIALS

- A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.
 - 1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with a taper of 1/4-inch per 12 inches, unless otherwise indicated.
 - 2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- B. Rigid Polyisocyanurate Roof Insulation:
 - 1. Qualities: Polyisocyanurate board to ASTM C1289, Type II, Class I, Grade 3; rigid, closed cell type, with specially formulated organic/inorganic facers.
 - 2. Available Manufacturers:
 - a. ENRGY 3 by Johns Manville.
 - b. H-Shield by Hunter Panels.
 - c. Hy-Therm AP-25 by DOW Chemical Company.
 - d. Roofing Manufacturer.
 - 3. Physical Properties:
 - a. Board Size: 48 inches x 96 inches.
 - b. Nominal Product Thickness: 4.25 inches; areas of tapered insulation is an additional thickness of insulation; roof drains tapered as indicated on the Drawings.
 - c. Compressive Strength (ASTM D1621): Minimum 25 psi (170kPa).
 - d. Density (ASTM D1622): 2 pcf.
 - e. Edges: Square.
 - f. Dimensional Stability: Less than 2 percent linear change.
 - 4. Provide tapered insulation as indicated on Drawings; 1/4 inch per running foot.
- C. Cover Board:
 - 1. Project Standard: 1/4-inch DENS-DECK Roof Board by G-P Gypsum Corp.
 - 2. Contractor Option: 1/4-inch DENS-DECK Prime Roof Board by G-P Gypsum Corp. or manufacturer's approved gypsum based product.
 - 3. Performance Characteristics:
 - a. Nonstructural, glass mat-embedded, water-resistant gypsum core panels.
 - b. UL Classified Type DGG when tested in accordance with ASTM E119.
 - c. ASTM C1177 compliance.
 - d. Noncombustible core per ASTM E136.

2.7 INSULATION ACCESSORIES

- A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with roofing material.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Low-rise, two-component urethane adhesive.
- C. Tapered Edge Strips: Rigid, cellulosic-fiber insulation board, complying with ASTM C 208, Type 2; coated on six sides.
- D. Self-adhered Air and Vapor Control Membrane:
 - 1. Description: 1mm (40mils) self-adhered air and vapour control membrane consisting of a self-adhering SBS rubberized asphalt laminated to a tough, slip resistant, cross laminated polyethylene surface film.

2. Must be capable of spanning metal deck flanges in assembly tested within fully adhered insulation and roofing.
3. Characteristics:
 - a. Tensile Strength - ASTM D 2523: 4378 N/m (25 lb/in)
 - b. Tensile Strength-Facer - ASTM D 412: 34.5 MPa (5000 psi)
 - c. Tensile Strength-Membrane - ASTM D 412: 4.3 MPa (625 psi)
 - d. Adhesion to Plywood - ASTM D 903: 1050 N/m (6 lb/in)
 - e. Permeance - ASTM E 96: 0.05 perms (max)
 - f. Thermal Stability (Sag 93°C) - ASTM D 1970: Pass
 - g. Elongation (Adhesive) - ASTM D 412: 250%
 - h. Low Temperature Flexibility ASTM D 1970: Unaffected (-32°C)
4. Basis-of-Design: Tremco AVC Membrane of equivalent of other named manufacturers.
 - a. Primer: Tremco AVC Membrane Primer suited to conditions.

2.8 WALKWAYS

- A. Roof Walkways: Mineral-surfaced asphaltic composition panels, factory formed, non-porous, with slip-resisting surface texture, manufactured specifically for adhering to built-up roofing as a protection course for foot traffic.
- B. Walk pads must be installed in maximum 5-foot long pieces with space between pieces for lateral water movement.
- C. Locations: At equipment, ladders, roof hatches; and any other locations indicated on Drawings.

2.9 COATING MATERIALS

- A. Flood Coat and Aggregate Surfacing:
 1. Flood coat shall be Rock-it Adhesive by Tremco or Approved Equal. A white cold applied, highly reflective low volatile surfacing adhesive.
 2. Provide aggregate surfacing that will withstand weather exposure without significant deterioration and will not contribute to membrane degradation, of the following type and size:
 - a. Lucas Fire White Highly Reflective Marble Roofing Aggregate.
 3. Roof Surface Solar Reflectance Index (SRI): Minimum 78 for low-sloped roofs.
 4. Thermal emittance (adhesive plus aggregate), ASTM C 1371: 0.85.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches (90 mm) and 6 inches (150 mm), respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.4 INSULATION INSTALLATION

- A. Comply with built-up roofing manufacturer's written instructions for installing roof insulation.
- B. Install tapered insulation under area of roofing to conform to slopes indicated.
- C. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Adhered Insulation - Metal Deck with Self-adhered Air and Vapor Control Membrane: Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - 2. Adhesive ribbon application to be of the appropriate tested spacing within the roofing field, at roofing perimeters, and within corners, to meet performance requirements within the Section.
 - 3. Apply temporary weight uniformly over boards to ensure full contact and bonding with adhesive.
- G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing manufacturer.
 - 1. Adhere cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.
 - 3. Apply adhesive to underside, and immediately bond cover board to substrate.

3.5 BUILT-UP ROOFING INSTALLATION, GENERAL

- A. Install roofing membrane according to roofing manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
 - 1. Install roofing system BU-4-I-A-A, according to roof assembly identification matrix and roof assembly layout illustrations in NRCA's "The NRCA Roofing and Waterproofing Manual" and requirements in this Section.
- B. Start installation of built-up roofing in presence of manufacturer's technical personnel.
- C. Cooperate with testing agencies engaged or required to perform services for installing roofing.
- D. Coordinate installation of roofing so insulation and other components of built-up roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed built-up roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- E. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
- F. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.

3.6 ROOFING MEMBRANE INSTALLATION

- A. Install lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - 1. Adhere to substrate in a solid mopping of hot roofing asphalt.
- B. Install three ply sheets starting at low point of roofing. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.
 - 1. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.
- C. Aggregate Surfacing: Promptly after installing and testing roofing membrane, base flashing, and stripping, flood-coat roof surface with 5 gal/100 sq. ft. of cold applied flood coat. While flood coat is fluid, cast the following average weight of aggregate in a uniform course:
 - 1. Aggregate Weight: 250 lb/100 sq. ft.
 - 2. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at a rate of 20 lb/100 sq. ft.

3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to built-up roofing manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by built-up roofing manufacturer.
 - 2. Flashing Sheet Application: Adhere flashing sheet to substrate in a full application of solvent free flashing adhesive. Overlap vertical flashings 4" and all vertical laps heat welded.
 - 3. Revise dimensions in first paragraph below if required. Verify minimum and maximum height limits with manufacturers if necessary. NRCA recommends a minimum base-flashing height of 8 inches (200 mm) and a maximum of 24 inches (600 mm).
- B. Extend base flashing up walls or parapets a minimum of 8 inches above built-up roofing and 6 inches onto field of built-up roofing. At parapet walls TPA flashing will extend up and over top of parapet wall and nailed off to back side.
- C. Install term bar, teflon tape, and mechanically fasten top of base flashing 6" o.c. securely at all terminations and perimeter of roofing.
- D. Install stripping, according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
 - 1. Built-up Stripping: Install stripping of not less than two roofing membrane ply sheets, setting each ply in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt, and extend onto roofing membrane 4 inches and 6 inches, respectively.
 - 2. At end of project clean all flashings to provide clean white sheet.
- E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphalt roofing cement on completed built-up roofing. Cover metal flashing with built-up roofing cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of built-up roofing. Clamp built-up roofing, metal flashing, and stripping into roof-drain clamping ring.
 - 1. Install stripping according to roofing manufacturer's written instructions.

3.8 WALKWAY INSTALLATION

- A. Roof Walkways: Install walkway roof pavers according to roofing manufacturer's written instructions in locations indicated, to form walkways. Clean roof membrane surface with Low volatile primer. Adhere walkways with asphaltic mastic.

3.9 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's trained technician to inspect roofing installation before flood coat is applied upon completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
 - 2. There will be no deviation from this Section, without prior written consent of the Architect and manufacturer, who will have the option of refusing to accept the installation.
 - 3. Confirm that the manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.
 - 4. Repair of Deficiencies: Installations or details noted as deficient during Final Inspection must be repaired and corrected by applicator, and made ready for reinspection, within five working days.

5. Warranty will be issued upon approval of the installation.

3.10 PROTECTING AND CLEANING

- A. Protect built-up roofing membrane from damage and wear during remainder of construction period.
- B. For roof areas that are to remain intact and that are subject to foot traffic and damage, provide temporary wood walkways with notches in sleepers to permit free drainage. Provide fiberboard cover over roofing membrane under temporary wood walkways and adjacent areas; round all edges and corners of wood bearing on roof surface. Receive approval from roofing material manufacturer technician before any traffic is permitted over any new roofing.
- C. Protect built-up roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- D. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, and repair or reinstall roofing to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- F. Protect building surfaces against damage from roofing Work.
- G. Prevent materials from entering or clogging drains and conductors.
- H. Replace or restore other Work damaged by installations of the roofing system.
- I. Protection of Property:
 - 1. Provide protection of property during course of roofing Work.
 - 2. Protect lawns, shrubbery, paved areas, and building from damage; necessary repair of damages will be at no extra cost to Owner.

PART 4 - INSTALLER'S WARRANTY CONDITIONS

WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

Owner:

Address:

Building Name/Type:

Address:

Area of Work:

Acceptance Date:

Warranty Period:

Expiration Date:

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

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

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

Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

- lightning;
- peak gust wind speed exceeding ____ mph;
- fire;
- failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
- faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
- vapor condensation on bottom of roofing; and
- activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

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

Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to

Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, 201__.

Authorized Signature:

Name:

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Manufactured reglets.
 - 2. Formed wall flashing and trim.
 - 3. Exposed trim not part of other assemblies.
 - 4. Parapet wall covering.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
 - 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
 - 1. Include similar samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12 inches long. Include fasteners, closures, and other attachments.
 - 2. Trim: 12 inches long. Include fasteners and other exposed accessories.
 - 3. Accessories: Full-size Sample.

1.4 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Mockups: Demonstrate aesthetic effects and set quality standards for fabrication and installation, as appropriate within wall construction mockups required under other sections.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.6 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 PRODUCTS

2.1 SHEET METALS

- A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
 - 1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.
 - b. Color: Match Architect's samples.
 - 2. Aluminum Thickness: Fabricate components not specified under other Sections or indicated on Drawings, from coil stock minimum thickness 0.040 inch.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

1. Finish: No. 2D (dull, cold rolled).
2. Through-wall: Minimum 0.0156 inch thick.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 3. Blind Fasteners: High-strength stainless-steel rivets.
- C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 MANUFACTURED COUNTERFLASHINGS AND REGLETS

- A. Available Manufacturers:
 1. Fry Reglet Corporation.
 - a. Heckmann Building Products Inc.
 - b. OMG Edge Metal.
 - c. Keystone Flashing Company, Inc.
 - d. Sandell Manufacturing Company, Inc.
 2. Material: Stainless steel, 0.0187 inch thick.
 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Masonry Type: Provide with top flange to set in mortar joint; bent leg to resist pull-out.
 5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.5 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12 foot long, sections, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams. Fabricate from the following material:
 - 1. Stainless Steel: 0.0156 inch thick.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Coat side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - 1. Aluminum: Use aluminum or stainless-steel fasteners.
 - 2. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints sealant as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for

installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

1. Do not solder prepainted, metallic-coated steel and aluminum sheet.
2. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.4 CLEANING AND PROTECTION

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

END OF SECTION

SECTION 07 71 00 - MANUFACTURED ROOF SPECIALTIES**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following manufactured roof specialties:
 - 1. Copings.
 - 2. Roof edge flashings.
 - 3. Prefabricated roof expansion joint covers.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. FMG Listing: Manufacture and install copings and roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification; Wind Zone 2 ratings. Identify materials with FMG markings.
 - 1. FM tested and approved means of fastening.
- C. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Qualification data for manufacturer and qualified professional engineer licensed in the State of Maryland.
- C. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer (licensed in Maryland); show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:
 - 1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
 - 2. Details for expansion and contraction.
- D. Fabrication Samples: For copings and roof edge flashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings and roof edge flashings with performance requirements.
- F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- B. Manufacturer Qualifications: Manufacturer capable of providing engineering and field service representation during construction.
 - 1. Engineering Responsibility: Preparation of data for including the following:
 - a. Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of Maryland.
 - 2. Company with a minimum of ten years of continuous experience manufacturing perimeter metal systems of the type specified and capable of providing the following information.
 - 3. List of five other projects of similar size, including approximate date of installation and name of architect for each.
- C. Product Qualifications: Products must be accepted by roofing manufacturer within the total system warranty and listed by name on the roofing manufacturer's letterhead, as described under submittals for Section 07 51 00.

1.5 COORDINATION

- A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Warranty for Wind Resistance:
 - 1. Manufacturer shall guarantee that a standard size roof edge system, when installed per manufacturer's instructions, will not blow off, leak, or cause membrane failure, even in wind conditions up to 110 mph, or the manufacturer shall at their option repair or replace their materials.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
3. Basis-of-Design Product: The designs for copings and roof edge flashings are based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers specified.
4. Roofing manufacturer can supply copings and gravel stops if they comply with all product specification requirements.

2.2 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
 1. Surface: Smooth, flat finish.
 2. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Exterior Finish: Fluoropolymer 2-Coat Coating System - Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat (containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
 1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Exterior Finish: Fluoropolymer 2-Coat Coating System - Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat (containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

2.3 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, one-piece corner units, and end cap units.
 - 1. Available Products - Typical:
 - a. Permasnap by OMG Edge Metal.
 - b. PerformaEdge Coping by Imetco.
 - c. Perma-Tite Coping by Metal-Era.
 - d. Roofing Manufacturer.
 - 2. Basis-of-Design Product - Special Profiles: Refer to Drawings for custom profile.
 - a. Profile by OMG Edge Metal.
 - b. PerformaEdge (Custom) Coping by Imetco.
 - 3. Coping Caps: Snap-on, fabricated from the following exposed metal:
 - a. Aluminum: 0.063 inch thick.
 - 4. Coping Cap Color: Custom color match to Metal Wall Panels; Section 07 42 13.
 - 5. Corners: Continuously welded; field verify actual constructed angles for factory-fabricated project-specific prefabricated corners.
 - 6. Transitions: Provide project-specific factory-fabricated continuously welded transitions including, but not limited to, transition miters, "z"-miters (steps in exterior wall 18 inches or less), tee miters, end terminations and end caps.
 - 7. Snap-on Coping Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.
 - 8. Face Leg Cleats: Concealed, continuous galvanized steel sheet.

2.6 ROOF EDGE FLASHINGS

- A. Canted Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on compression-clamped metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized steel sheet cant dam, 0.028 inch thick, minimum, with integral drip edge cleat.
 - 1. Available Products - Typical:
 - a. Safeguard NP by OMG Edge Metal.
 - b. PerformaEdge Fascia by Imetco.
 - c. System 300 Perma-Tite Fascia by Metal-Era.
 - d. Roofing Manufacturer.
 - 2. Basis-of-Design Product - Special Profiles: Refer to Drawings for custom profile.

- a. Profile by OMG Edge Metal.
 - b. PerformaEdge (Custom) Fascia by Imetco.
3. Fascia Cover: Fabricated from the following exposed metal:
 - a. Aluminum:
 - 1) Typical: Minimum 0.063 inch thick.
 - 2) Special Profiles: Minimum 0.063 inch thick.
4. Fascia Cover Color: Custom color match to Metal Wall Panels; Section 07 42 13.
5. Provide matching mitered and welded corner units; field verify actual constructed angles for factory-fabricated project-specific prefabricated corners.
6. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

2.7 PREFABRICATED ROOF EXPANSION JOINT COVER

- A. Basis-of-Design: Roof to Roof Expansion Joint by OMG Edge Metal.
- B. Other Acceptable Manufacturers:
 1. Metal Era.
 2. Imetco.
 3. Roofing manufacturer.
- C. Characteristics:
 1. Formed metal cap; concealed joint cover and gutter chair.
 2. 20 gage galvanized steel articulating cleat.
 3. Predrilled for shouldered fasteners 18 inches o.c. on both curbs.
 4. Provide with in-joint condensate seal and insulation.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces

specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

1. Install manufactured roof specialties with provisions for thermal and structural movement.
 2. Torch cutting of manufactured roof specialties is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
- D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.3 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to resist uplift and outward forces according to performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.

3.4 ROOF EDGE FLASHING INSTALLATION

- A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.5 CLEANING AND PROTECTION

- A. Clean off excess sealants.
- B. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings and pieces of flashing. Maintain in a clean condition during construction.
- C. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 23 - DOWNSPOUTS**PART1 GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Pre-fabricated aluminum downspouts at protective covers.
- B. Related Sections include the following:
 - 1. Division 10 Section "Protective Covers".

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International: ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. Federal Specification Unit: FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
- D. Sheet Metal and Air Conditioning Contractors' National Association, Inc.: SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- B. Product Data: Submit data on manufactured components, materials, and finishes.
- C. Samples: Submit two samples, 24 inches long illustrating component design, finish, color, and configuration.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA Manual; maintain one copy of manual on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack products to prevent twisting, bending, and abrasion, and to provide ventilation; slope to drain.
- B. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

PART 2 PRODUCTS**2.1 DOWNSPOUTS**

- A. Available Manufacturers:
 - 1. Berger Building Products Corp.
 - 2. Metal-Era.
 - 3. W.P. Hickman Company.
- B. Product Description:
 - 1. Downspouts: SMACNA round profile; Figure 1-32A. Coordinate size and location with protective covers.

2.2 COMPONENTS

- A. Pre-Finished Aluminum Sheet:
 - 1. ASTM B209, manufacturer's standard alloy and temper for specified finish; shop pre-coated with three coat PVDF (polyvinylidene fluoride) coating.
 - a. Downspouts: 0.050 inch thick.
 - 2. Color: Custom color to match Architect's sample.

2.3 ACCESSORIES

- A. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: In accordance with SMACNA requirements.
 - 2. Downspout Supports - Typical: Brackets; SMACNA Figure 1-35E.
- B. Strainers: 15 gage stainless steel wire baskets.
- C. Fasteners: Aluminum or Stainless steel, with EPDM washers.
- D. Protective Backing Paint: FS TT-C-494, Bituminous.

2.4 FABRICATION

- A. Fabricate with required connection pieces.
- B. Form sections to shape indicated on Drawings, square, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance; allow for expansion at joints.
- C. Hem exposed edges of metal.
- D. Fabricate downspout accessories; seal watertight.

2.5 FACTORY FINISHING

- A. PVDF (polyvinylidene fluoride) Coating: Multiple coat, thermally cured, fluoropolymer system conforming to AAMA 2605.
- B. Color: Custom color to match Architect's sample.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify surfaces are ready to receive downspouts.

3.2 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mils.

3.3 INSTALLATION

- A. Join lengths with formed seams sealed watertight.
- B. Support Spacing:
 - 1. Downspouts: SMACNA Figure 1-35.
- C. Set downspouts plumb and not less than 1 inch from the wall.
- D. Make joints between lengths of downspouts by telescoping the end of the upper lengths at least 3/4 inch into the lower length.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Roof curbs.
 - 2. Equipment supports.
 - 3. Prefabricated and engineered fixed wall ladders with roof parapet return without cage and high parapet access configurations.

1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 - 1. Size and location of roof accessories specified in this Section.
 - 2. Method of attaching roof accessories to roof or building structure.
 - 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
- D. Delegated Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation; code compliant.

1.3 QUALITY ASSURANCE

- A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755.
 - 1. Galvanized Steel Sheet: ASTM A 653, G90 coated.
 - 2. Exposed Finishes:
 - a. Roof Curbs, Equipment Curbs and Pipe Supports: Manufacturer's standard powder coat.
- B. Steel Shapes: ASTM A 36, hot-dip galvanized to comply with ASTM A 123, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPAC2; not less than 1-1/2 inches thick.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.
- D. Gaskets: Manufacturer's standard tubular or fingered design of EPDM, or PVC; or flat design of foam rubber.
- E. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.4 ROOF CURBS

- A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 - 1. Available Manufacturers:
 - a. Custom Curb, Inc.
 - b. LM Curbs.
 - c. Pate Company (The).
 - d. Roof Products & Systems Corporation.
 - e. Roof Products, Inc.
 - f. ThyCurb; Div. of Thybar Corporation.
 - 2. Load Requirements: Indicated on Drawings.

3. Material: Galvanized steel sheet, 14 gage thick.
 - a. Finish: High-performance organic coating.
4. Liner: Same material as curb, of manufacturer's standard thickness and finish.
5. Factory install wood nailers at tops of curbs.
6. Factory insulate curbs with 1-1/2-inch thick, glass-fiber board insulation.
7. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 10 inches, unless otherwise indicated.
8. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.5 EQUIPMENT SUPPORTS

- A. Equipment Supports: Provide metal equipment supports, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
 1. Available Manufacturers:
 - a. Custom Curb, Inc.
 - b. LM Curbs.
 - c. Pate Company (The).
 - d. Roof Products & Systems Corporation.
 - e. Roof Products, Inc.
 - f. ThyCurb; Div. of Thybar Corporation.
 2. Load Requirements: Indicated on Drawings.
 3. Material: Galvanized steel sheet, 14 gage thick.
 - a. Finish: High-performance organic coating.
 4. Factory-install continuous wood nailers at tops of equipment supports.
 5. Metal Counterflashing: Manufacturer's standard removable counterflashing, fabricated of same metal and finish as equipment support.
 6. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
 7. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.6 PREFABRICATED AND ENGINEERED FIXED WALL LADDERS WITH ROOF PARAPET RETURN WITHOUT CAGE AND HIGH PARAPET ACCESS CONFIGURATIONS

- A. Manufacturers:
 1. O'Keeffe's Inc.
 2. Royalite Manufacturing Inc.
 3. ALACO.
 4. Precision Ladders.
- B. Type: Prefabricated fixed wall ladders with parapet return.
- C. Materials:
 1. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
 2. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.
- D. Fabrication:

1. Ladder: Side rails with minimum 29 mm (1-1/8 inch) round rungs that are serrated and secured with cast aluminum connectors, 4 solid rivets and minimum 9.5 mm (3/8 inch) thick brackets mounted to the walls.
2. Provide minimum 72-inch high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.
3. Finish: Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 2. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. Roof Curb Installation: Set roof curb so top surface of roof curb is level.
- F. Equipment Support Installation: Set equipment support so top surface of equipment support is level.
- G. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION

SECTION 07 84 00 - 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.
- C. Smoke seals.

1.2 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.
- C. ITS (DIR) - Directory of Listed Products; current edition.
- D. FM 4991 - Approval Standard for Firestop Contractors; 2013.
- E. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- F. UL (FRD) - Fire Resistance Directory; current edition.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For firestopping materials, if applicable: Material Ingredient Report.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include material cost value.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Qualification statements for installing mechanics.
- G. All accepted report submittals shall be submitted to the local authority having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the specified fire ratings when tested in accordance with ASTM E 814 and ASTM E 119.
 - 1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- B. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:

2. With minimum 3 years documented experience installing work of this type.
 3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
 4. Approved by firestopping manufacturer.
- C. Installing Mechanic's Qualifications: Trained by firestopping manufacturer and able to provide evidence thereof.

1.5 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEMS

- A. F-Rated (Flame Rated) Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated as determined per ASTM E814, UL 1479 but not less than that equaling or exceeding the fire resistance rating of the construction penetrated.
- B. T-Rated (Temperature Rated) Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas; T-rated assemblies are required where specified by codes or where the following conditions exist:
1. Where firestop systems protect penetrations located outside of wall cavities.
 2. Where firestop systems protect penetrations located outside fire resistive shaft enclosures.
 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature rise rating.
 4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 square inches in overall cross sectional area.
- C. Fire Resistive Joint Sealants: Provide joint sealants with fire resistance ratings indicated, as determined per UL 2079 or (ASTM E1399, E1966 and E2307), but not less than that equaling or exceeding the fire resistance rating of the construction in which the joint occurs.
1. Interior wet-applied sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

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 matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to arrest liquid material 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 authority having jurisdiction.
- C. Install labelling required by code.

3.4 FIELD QUALITY CONTROL

- A. Provide independent third-party inspection of the installed firestopping after application and prior to its concealment.
- B. Repair or replace any damaged areas of firestopping.

3.5 PROTECTION

- A. Clean adjacent surfaces of firestopping materials.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 84 46 - FIRE-RESISTIVE JOINT SYSTEMS**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-floor joints.
 - 2. Floor-to-wall joints.
 - 3. Head-of-wall joints.
 - 4. Wall-to-wall joints.
 - 5. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.
 - 6. Smoke seals.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities indicated as determined by UL 2079.
- C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated on Drawings, as determined by NFPA 285 and UL 2079.
 - 1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
- D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
- C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.
- D. Qualification Data: For Installer.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For insulation, if applicable: Material Ingredient Report.
 - 2. EQ Credit 2: Low-Emitting Materials

- a. For interior wet-applied sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include material cost value.

1.4 QUALITY ASSURANCE

- A. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- B. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:
 - a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
 - b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.
- C. VOC content not to exceed 250 g/L.

1.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

- D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- B. Accessories:
 - 1. Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article.
 - 2. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.
 - 3. Holding Clips: Minimum 30 gage by 1 inch wide galvanized sheet steel Z-shaped clips to support safing insulation.

2.2 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BOARD INSULATION

- A. Available Manufacturers:
 - 1. Fibrex Insulations Inc.
 - 2. Owens Corning.
 - 3. Thermafiber.
- B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics.
 - 1. Nominal minimum density of 4 lb/cu. ft
 - 2. Fiber Color: Regular color, unless otherwise indicated.
 - 3. Fiber Color: Darkened, where indicated.
 - 4. Uses: Where indicated and as fire safing insulation.
- C. Foil-Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612; faced on 1 side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.
- B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner may engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.
- B. Testing Services: Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until inspecting agency determines completed work shows compliance with requirements.
1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- C. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION

SECTION 07 90 05 - JOINT SEALERS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Sealants and joint backing.
- B. Precompressed foam sealers.

1.2 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For sealants, if applicable: Material Ingredient Report.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealant primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include material cost value.

1.4 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.5 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.

- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Sealants:
1. Bostik Inc: www.bostik-us.com.
 2. Pecora Corporation: www.pecora.com.
 3. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 4. Dow Corning Corporation.
 5. GE Silicones .
 6. Tremco.
- B. Preformed Compressible Foam Sealers:
1. EMSEAL Joint Systems, Ltd: www.emseal.com.
 2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
 3. Dayton Superior Corporation: www.daytonsuperior.com.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants:
1. As selected by Architect from manufacturer's full range.
 2. Allow custom colors for masonry joints.
 3. Allow for four custom exterior custom colors including masonry joints.
- C. Interior wet-applied sealants and sealant primers: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.3 SEALANTS

- A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 61 16.
- B. Type LS-1 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
1. Color: Standard colors matching finished surfaces.
- C. Type AS-1 - Acoustical Sealant for Concealed Locations: Permanently tacky non-hardening butyl sealant.
1. Applications: Use for concealed locations only:
 - a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
 - b. Sealant between acoustical ceiling perimeter track and wall.
- D. Single-Component Neutral- and Basic-Curing Silicone Sealant ES-1:
1. Products:
 - a. Dow Corning Corporation; 790.
 - b. Tremco; Spectrem 1 (Basic).
 - c. GE Silicones; SilPruf SCS2000.
 - d. Pecora Corporation; 864.

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- e. Polymeric Systems Inc.; PSI-641.
 - f. Sonneborn, Division of ChemRex Inc.; Omniseal.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 100/50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and brick.
 - 6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
- E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-2:
- 1. Products:
 - a. Pecora Corporation; 898.
 - b. Tremco; Tremsil 600 White.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: color anodic aluminum aluminum coated with a high-performance coating galvanized steel and ceramic tile.
- F. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant ES-3:
- 1. Products:
 - a. Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary SCS1700.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: color anodic aluminum, aluminum coated with a high-performance coating, and ceramic tile.
- G. Multicomponent Nonsag Urethane Sealant ES-4:
- 1. Products:
 - a. Pecora Corporation; Dynatrol II.
 - b. Tremco; Dymeric 240/240FC.
 - c. Tremco; Vulkem 921.
 - 2. Type and Grade: M (multicomponent) and NS (nonsag).
 - 3. Class: 50.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, ceramic tile, and wood.
- H. Multicomponent Nonsag Urethane Sealant ES-5:
- 1. Products:
 - a. Sonneborn, Division of ChemRex Inc.; NP 2.
 - b. Tremco; Vulkem 227.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
6. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and brick.

2.4 PREFORMED JOINT SEALERS

- A. Type PS-1 - Exterior Expansion Joint Sealer: Precompressed foam sealer; factory-applied and cured silicone facing.
 1. Face color: Coordinated with veneer; to be selected by Architect.
 2. Size as required to provide weathertight seal when installed.
 3. Provide product recommended by manufacturer for traffic-bearing use.
 4. Product: Colorseal manufactured by EMSEAL.
 5. Applications: Use for:
 - a. Exterior wall expansion joints.

2.5 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Secondary Joint Backing: Precompressed foam sealer; urethane with water-repellent.
 1. Size as required to provide weathertight seal when installed.
 2. Product: Backerseal manufactured by EMSEAL.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

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.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints concave.

3.4 CLEANING

- A. Clean adjacent soiled surfaces.

3.5 PROTECTION

- A. Protect sealants until cured.

3.6 SCHEDULE

- A. Joint-Sealant Application JS-1: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
 - 1. Joint Sealant: ES-1 or ES-4.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application JS-2: Exterior horizontal traffic isolation and contraction joints in cast-in-place concrete slabs.
 - 1. Joint Sealant: ES-5.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- C. Joint-Sealant Application JS-3: Exterior vertical control and expansion joints in unit masonry.
 - 1. Joint Sealant: ES-1 or ES-4.
 - 2. Joint-Sealant Color: Maximum of four custom colors.
- D. Joint-Sealant Application JS-5: Exterior vertical joints between different materials listed above.
 - 1. Joint Sealant: ES-1 or ES-4.
 - 2. Joint-Sealant Color: Maximum of four custom colors.
- E. Joint-Sealant Application JS-6: Exterior perimeter joints between masonry and frames of doors, windows, and louvers.
 - 1. Joint Sealant: ES-1 or ES-4.
 - 2. Joint-Sealant Color: Maximum of four custom colors.
- F. Joint-Sealant Application JS-7: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. Joint Sealant: ES-4.
 - 2. Joint-Sealant Color: To be field painted.
- G. Joint-Sealant Application JS-8: Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: ES-2 or ES-3.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- H. Joint-Sealant Application JS-9: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
 - 1. Joint Sealant: ES-2 or ES-3.
 - 2. Joint-Sealant Color: Maximum of two custom colors.

- I. Joint-Sealant Application JS-10: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Joint Sealant: ES-2 or ES-3.
 - 2. Joint-Sealant Color: White.
- J. Joint-Sealant Application JS-11: Vertical joints on exposed surfaces of interior unit masonry and concrete walls.
 - 1. Joint Sealant: ES-4.
 - 2. Joint-Sealant Color: To be field painted.
- K. Joint-Sealant Application JS-12: Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
 - 1. Joint Sealant: LS-1.
 - 2. Joint-Sealant Color: To be field painted.
- L. Joint-Sealant Application JS-13: Preformed exterior expansion joints without cover.
 - 1. Location: Where designated on drawings.
 - 2. Joint Sealant: PS-1, where indicated to produce a finished color.

END OF SECTION

SECTION 07 95 13 - EXPANSION JOINT COVER ASSEMBLIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Expansion joint assemblies for floor, wall, ceiling surfaces.

1.2 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories: Placement of joint assembly frames in formwork.

1.3 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction, anchorage locations .
- D. Samples: Submit two samples minimum 12 inch long, illustrating profile, dimension, color, and finish selected.
- E. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Architectural Art Mfg. Company.
 - 1. Floor-to-Floor Joint Systems: A Series.
 - 2. Floor-to-Wall Joint Systems: A Series.
 - 3. Wall-to-Wall Joint Systems: H Series.
 - 4. Wall-to-Ceiling Joint Systems: C Series.
 - 5. Ceiling-to-Ceiling Joint Systems: C Series.
- B. Balco, Inc.
 - 1. Floor-to-Floor Joint Systems: 6000 Series.
 - 2. Floor-to-Wall Joint Systems: 6000 Series.
 - 3. Wall-to-Wall Joint Systems: 6TW Series.
 - 4. Wall-to-Ceiling Joint Systems: 7500 Series.
 - 5. Ceiling-to-Ceiling Joint Systems: 7500 Series.
- C. Construction Specialties, Inc: www.c-sgroup.com.
 - 1. Floor-to-Floor Joint Systems: ALS Series, PC-900
 - 2. Floor-to-Wall Joint Systems: ALSW Series.
 - 3. Wall-to-Wall Joint Systems: AFW Series.
 - 4. Wall-to-Ceiling Joint Systems: Thinline Series; Type FCF.

5. Ceiling-to-Ceiling Joint Systems: Thinline Series; Type FCF.
- D. MM Systems Corp.:
 1. Floor-to-Floor Joint Systems: Classic Cover Systems; Type HFX.
 2. Floor-to-Wall Joint Systems: Classic Cover Systems; Type HFXE.
 3. Wall-to-Wall Joint Systems: Model FX-K for flat and Model FX-L for corner.
 4. Wall-to-Ceiling Joint Systems: Flexible Wall and Ceiling Series VSWL and VSGL.
 5. Ceiling-to-Ceiling Joint Systems: Flexible Wall and Ceiling Series VSG.

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. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

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: Natural anodized.
 2. Exposed Finish at Floors: Mill finish or natural anodized.
 3. Exposed Finish at Walls and Ceilings: Natural anodized.
- B. Resilient Seals:
 1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
 2. Color: To be selected from manufacturers full line.
- 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. Resilient Filler: Neoprene, exhibiting Shore A hardness of 40 to 50 Durometer.
- F. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

2.4 FABRICATION

- A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush mounted.
- B. Back paint components in contact with cementitious materials.
- C. Shop assemble components and package with anchors and fittings.
- D. Provide joint components in single length wherever practical. Minimize site splicing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 PREPARATION

- A. Provide anchoring devices for installation and embedding under Section 03 10 00.
 - 1. Provide templates and rough-in measurements.

3.3 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level.
- C. Rigidly anchor to substrate to prevent misalignment.

3.4 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Fire-rated steel doors and frames.
- D. Thermally insulated steel doors.
- E. Steel glazing frames.

1.2 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.3 REFERENCE STANDARDS

- A. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- B. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- D. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
- E. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- G. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- H. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel doors and frames: Industry-wide or product-specific EPD.
 - 2. 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.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Maintain at the project site a copy of all reference standards dealing with installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Assa Abloy Ceko, Curries, or Fleming: www.assaabloydss.com/#sle.
- B. Steelcraft: www.steelcraft.com.
- C. Pioneer Industries .
- D. Security Metal Partitions Corporation.

2.2 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
 - 1. Door Top Closures: Flush with top of faces and edges.
 - 2. Door Edge Profile: Beveled on both edges.
 - 3. Door Texture: Smooth faces.
 - 4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 - 5. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 - 6. Galvanizing for Exterior Units and Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
 - 7. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all 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.
- C. Recycled Content: Provide steel with minimum 25 percent post-consumer recycled content.

2.3 STEEL DOORS

- A. Exterior Doors :
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
 - 2. Core: Polystyrene foam.
 - 3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 - 4. Weatherstripping: Separate, see Section 08 71 00.
 - 5. Close to and bottom edges with galvanized, inverted steel channels; seal joints in top edges of doors against water penetration.
- B. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
- C. Interior Doors, Fire-Rated:
 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
 2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
 - a. Rate of Temperature Rise Across Door Thickness for Stair Enclosure Doors: 450 F degrees.
 - b. Provide units listed and labeled by UL.
 - c. Attach fire rating label to each fire rated unit.

2.4 STEEL FRAMES

- A. General:
 1. Comply with the requirements of grade specified for corresponding door, except:
 - a. ANSI A250.8 Level 3 Doors: 14 gage frames.
 - b. Frames for Wood Doors: Comply with frame requirements specified in 14 gage frames.
 - c. Frames for Sound-Rated Wood Doors: Comply with frame requirements specified in 14 gage frames.
 2. Finish: Same as for door.
 3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
 4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- B. Exterior Door Frames: Full profile welded, seamless.
 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 2. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire-Rated: Full profile welded type.
- D. Interior Door Frames, Fire-Rated: Full profile welded type.
 1. Fire Rating: Same as door, labeled.
- E. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
- F. Mullions and Transom Bars: Join to adjacent members by welding.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 ACCESSORY MATERIALS

- A. Glazing: As specified in Section 08 80 00 .
- B. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.
- E. Ceiling Struts: Minimum 1/4 inch thick by 1 inch wide steel.

2.7 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.8 INSECT SCREEN FOR KITCHEN DOOR

- A. Provide insect screens as indicated. Design door framing and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches.
- B. Screen Frames: Fabricate frames of tubular-shaped, extruded- or formed-aluminum members of 0.050-inch-minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match door. Provide removable PVC spline-anchor concealing edge of screen frame.
- C. Stainless Steel Wire Fabric: 18-by-16 mesh of 0.011 inch diameter, non-magnetic stainless steel wire, Type 304 or 316 complying with FS RR-W-365, Type VI.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.2 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door silencers in frames before grouting.
- E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- F. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- G. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- H. Coordinate installation of hardware.

- I. Coordinate installation of glazing; install frames with removable glazing stops located on secure side of opening.
- J. Coordinate installation of electrical connections to electrical hardware items.
- K. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
- L. Touch up damaged factory finishes.
- M. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.

3.3 TOLERANCES

- A. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
- B. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
- C. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
- D. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3.4 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- C. Remove grout and other bonding material from hollow metal work immediately after installation.
- D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- E. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical.

1.2 RELATED REQUIREMENTS

- A. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- B. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).
- C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- D. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- F. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Specimen warranty.
- D. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- E. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.
- F. Samples: Submit two samples of door veneer, 12 x 12 inch in size illustrating wood grain, stain color, and sheen.
 - 1. Full size door in selected color to be sent to job site for final approval by Architect prior to fabrication of the remaining doors for the project. If approved, door can be used in the Work and will be used as a representative sample.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For wood doors, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials

- a. For wood doors having 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, if available: 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.

H. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

- A. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.6 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.

1.7 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Eggers Industries/VT Industries: www.eggersindustries.com.
- B. Lambton Doors: www.lambtondoors.com.
- C. Masonite Architectural Aspiro Series; Marshfield-Algoma legacy brand.
- D. Oshkosh Architectural Door Company.

2.2 DOORS

- A. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Level: Premium Grade, in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1300.

- a. Grade A faces.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
3. Faces are bonded to core using a hot press.
4. Provide wood doors made from wood 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.
5. Composite wood doors: Comply 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.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 1. Provide solid core doors at all locations.
 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C or UBC Standard 7-2-97 ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
 3. Sound Retardant Doors: Minimum STC of 42 or better, calculated in accordance with ASTM E413, tested in accordance with ASTM E1408.
 - a. Provide doors specifically designed for sound transmission control with a high density core and damping.
 - b. Refer to hardware specification for required hardware items.
 4. Wood veneer facing with factory transparent finish.

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 above.
- B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.
- D. Recycled Content: Provide particleboard cores with minimum 80 percent recycled content; provide mineral cores with minimum 20 percent recycled content.

2.4 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Select White Maple, veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated; select free of dark streaks, worm track pattern and birds-eye.
 1. Vertical Edges: Any option allowed by quality standard for grade.
 2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.
 3. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 20 feet or more.

2.5 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.6 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with Bonded Stiles and Rails:

1. Provide solid blocks at lock edge for hardware reinforcement.
2. Provide solid blocking for other throughbolted hardware.
- C. Fit door edge trim to edge of stiles after applying veneer facing.
- 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.
- G. Composite Wood, Agrifiber Products and Laminating Adhesives (shop and field applied):
Contain no added urea formaldehyde resins.

2.7 FACTORY FINISHING - WOOD VENEER DOORS

- A. Factory finish doors in accordance with specified quality standard:
 1. Transparent Finish: Transparent catalyzed polyurethane, Premium quality, TR-6, satin sheen.
 2. Stain Color: A selected by Architect from manufacturers full range.

PART 3 EXECUTION

3.1 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.
- 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.

3.2 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.3 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 31 00 - ACCESS DOORS AND PANELS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Access door and frame units, fire-rated, in wall locations.

1.2 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products; current edition.
- B. UL (FRD) - Fire Resistance Directory; current edition.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of all access door units.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Babcock-Davis.
 - 1. Non-Rated: Cierra BNT Series.
 - 2. Rated: Cierra BIT Series.
- B. Karp Associates, Inc.
 - 1. Non-Rated: DSC-214M Series.
 - 2. Rated: KRP Series.
- C. Milcor Inc.:
 - 1. Non-Rated: Style M or DW.
 - 2. Rated: Style UFR or NIFR.
- D. Nystrom, Inc.
 - 1. Non-Rated: NT Series.
 - 2. Rated: Cierra I Series.
- E. Williams Bros. Corporation of America:
 - 1. Non-Rated: WB-GP or WB-DW Series.
 - 2. Rated: WB-FR Premium or WB-FR Standard with Drywall Bead.

2.2 ACCESS DOORS AND PANELS

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
- B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.
 - 1. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

2.3 ACCESS DOOR UNITS - WALLS AND CEILINGS

- A. Door and Frame Units: Formed steel.

1. Door: Minimum 16 gage thick sheet metal, set flush with exposed face flange of frame.
 2. Frame: Minimum 16 gage thick sheet metal with 1 inch wide, surface-mounted trim.
 3. Hinges: Concealed pivot rod.
 4. Lock: Provide door panel with cylinder keyed to building Best Lock masterkey program.
 5. Steel Finish: Factory primed for field painting.
- B. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Formed steel.
1. Fire-Resistance Rating: Not less than that of adjacent construction.
 2. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 3. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 20 gage.
 4. Frame: Minimum 16 gage thick sheet metal with 1-inch wide, surface-mounted trim.
 5. Hinges: Concealed-pin type.
 6. Automatic Closer: Spring type.
 7. Lock: Self-latching device with cylinder keyed to building Best Lock masterkey program.
 8. Steel Finish: Factory primed for field painting.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.
- C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 33 13 - COILING COUNTER DOORS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Non-fire-rated coiling counter doors and operating hardware.

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; 2015, with Editorial Revision (2016).

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish.
- C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 4 inches long illustrating shape, color and finish texture.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For doors having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.4 WARRANTY

- A. Warranty Period: Two years for defects in material and workmanship.

PART 2 PRODUCTS**2.1 COILING COUNTER DOORS**

- A. Coiling Counter Doors, Non-Fire-Rated: Stainless steel and steel slat curtain as noted.
 - 1. Mounting: Interior face mounted.
 - 2. Provide integral frame and sill of same material and finish.
 - 3. Nominal Slat Size: 1-1/4 inches wide.
 - 4. Slat Profile: Flat.
 - 5. Finish: No. 4 Stainless Steel at Cafeteria.
 - 6. Color: As selected by Architect from manufacturer's standard range.
 - 7. Guides: Formed track; same material and finish unless otherwise indicated.
 - 8. Hood: Manufacturer's standard; .
 - 9. Operation: Manual push up operation.
 - 10. Interior latch only.

2.2 MATERIALS

- A. Curtain Construction: Interlocking, single thickness 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 extruded stainless steel continuous channel or tubular shape to provide reinforcement and positive contact in closed position.
 3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G90/Z275 coating; minimum thickness 20 gage, 0.04 inch.
- B. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
 - C. Cylindrical Locking Mechanism: Latchset lock cylinder keyed to building Best Lock masterkey program, specified in Section 08 71 00.
 - D. Latching: Inside mounted, sliding deadbolt.
 - E. Roller Shaft Counterbalance: Steel pipe and torsion 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.
 - F. Integral Frame, Hood, and Fascia: Provide manufacturer's standard welded assemblies; fabricate of not less than 0.0625-inch-thick, stainless-steel sheet, Type 300 series, complying with ASTM A 240 or ASTM A 666.

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 sealants and backing materials at frame perimeter as specified in Section 07 90 05.

3.3 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.4 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Overhead coiling doors , operating hardware, exterior, electric operation.
- B. Wiring from electric circuit disconnect to operator to control station.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 83 - Wiring Connections: Power to disconnect.

1.3 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, length of 24 inch in size illustrating shape, color and finish texture.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For doors having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.5 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.6 WARRANTY

- A. Warranty Period: Two years for defects in material and workmanship.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
- B. The Cookson Company: www.cooksondoor.com/#sle.
- C. Overhead Door Company.

2.2 COILING DOORS

- A. Exterior Coiling Doors: Aluminum slat curtain.
 - 1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
 - 2. Sandwich slat construction with insulated core of closed cell pressure foamed in place urethane type insulation; insulation (u-) value: 0.50 BTU/hr sq ft deg F
 - 3. Nominal Slat Size: 2 inches wide x required length.
 - 4. Finish: Factory Powder Coat.
 - a. Color: Custom to match Architects sample.
 - 5. Guides: Angles; galvanized steel.
 - 6. Hood Enclosure: Manufacturer's standard; primed steel with powder coated finish.
 - 7. Electric operation.
 - 8. Mounting: Surface mounted.

2.3 MATERIALS

- 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 and where curtain enters hood enclosure of exterior doors.
- B. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063, minimum thickness of .040 inch for front slat and .024 inch for back slat.
- C. Steel Guides: Minimum 3/16 inch angle assemblies bolted to wall; powder coat finish.
- D. 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.

2.4 ELECTRIC OPERATION

- A. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Motor Enclosure:
 - 3. Motor Rating: 1/2 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 05 83 for electrical connections.
- B. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
 - 1. 24 volt circuit.
 - 2. Surface mounted.

- 3. Provide key switch control station at all locations; cylinder keyed to building Best Lock masterkey program.
- C. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.1 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 05 83.
- F. Complete wiring from disconnect to unit components.
- G. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 90 05.

3.2 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.

3.3 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.4 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.
- D. Perimeter sealant.
- E. Frame mounted sun shades.

1.2 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; 2009.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.
- G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- J. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.4 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - 1. Design Wind Loads: Comply with requirements of the (IBC) International Building code.
 - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E 283.
- D. Condensation Resistance Factor: CRF of not less than 57 (exterior frames) when measured in accordance with AAMA 1503.1.
- E. Thermal Resistance of Exterior Framing: Thermal transmittance U value not more than 0.38 BTU/HR/FT²/°F when measured in accordance with AAMA 1503.1.
- F. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 12 lbf/sq ft.
- G. 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.
- H. 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.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details .
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, sunshades and field welding required.
 - 1. Shop drawings must be prepared by the manufacturer under the supervision of a Professional Structural Engineer licensed in the State of Maryland.
 - 2. Shop drawings must be signed and sealed by the supervising Professional Structural Engineer licensed in the State of Maryland.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, considering and including loads applied by the sunshades and dimensional limitations.
 - 1. Must be signed and sealed by the supervising Professional Structural Engineer licensed in the State of Maryland.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations

- a. For storefront, sunshade, if available: 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 or aluminum in storefront, sunshade: 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, sunshade, if available: Material Ingredient Report.
4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- G. Product data for Credit IEQ 4.1: For adhesives and sealants applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L
- H. Report of field testing for water leakage.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 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 at the State of Maryland.
- B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum five years of documented experience.

1.7 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.8 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.

1.9 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.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide 20 year manufacturer warranty (painted finish) and 10 year manufacturer warranty (anodized finish) 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. EFCO, a Pella Company; Product System 403X Wall (exterior) and Product System 402 (interior): www.efcocorp.com.
- B. Kawneer North America (Basis-of-Design) ; Product TriFab VG 45UT (exterior) and TriFab VG 45I (interior): www.kawneer.com.
- C. YKK AP America ; Product System YES 45 XT (exterior) and Product YES 45 FI (interior): www.ykkap.com.

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. Cap extensions where shown in the drawings and sized per the details.
 - 4. Recycled Content in Aluminum: Provide minimum 30 percent recycled content.
 - 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.

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.
 - a. Contractor is to provide structurally reinforced members where required.
 - 4. Sill Flashing: Provide manufacturer's full height high-performance sill flashing.
- B. Doors: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Glazing Stops: Square.
- C. Vents: Provide project-out units.

1. The windows shall be Architectural Aluminum Project Out windows in accordance with ANSI/AAMA/nwwda 101/I.S.2-97 or NAFS-1 Voluntary Specifications for Aluminum and Poly Prime Windows and Glass Doors for a Class and Grade of P-HC40 to P-HC70 for Project Out Windows.
 - a. Units submitted for laboratory testing shall be manufacturer's standard construction, glazed and assembled in accordance with manufacturer's specifications and ANSI/AAMA/nwwda 101/I.S.2-97 or NAFS-02.
 2. Hinge: Concealed stainless steel four- or six-bar friction hinge; two per ventilator.
 3. Lock: Manufacturer's cam lock and keeper.
 4. Basis-of-Design: WV410 SSG by EFCO, a Pella Company.
 5. Insect Screens: Extruded aluminum frames, 6063-T5 alloy and temper, joined at corners; 18 x 16 mesh aluminum screen cloth; splines shall be extruded vinyl, removable to permit rescreening.
 - a. Frame Finish: To match aluminum window.
 - b. Screen Finish: Black anodized.
- D. Frame Mounted Sunshades: Profiles as shown on the drawings.
1. Manufacturers:
 - a. Basis-of-Design: Kawneer; Versoleil SunShade, 30 inch tapered outrigger, Circular.
 - b. YKK; ThermaShade.
 - c. EFCO; X-Therm E-Shade.
 2. Design Responsibility - Storefront manufacturer to include structural analysis of sunshades and their impact on the storefront system in the shop drawings and design calculations.
 3. Finish: Match framing system.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- D. Fasteners: Stainless steel.
- E. Exposed Flashings: 0.063 inch thick aluminum sheet; finish to match framing members.
- F. Concealed Flashings: 0.018 inch thick stainless steel.
- G. Perimeter Sealant: Type ES-1 or ES-4 specified in Section 07 90 05.
- H. Glass: As specified in Section 08 80 00.
- I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- J. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.
- K. Recycled content: Provide aluminum and steel components with recycled content.

2.5 FINISHES

- A. Interior Applications: Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Exterior Applications - Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) system.

1. Polyvinylidene fluoride (PVDF) 3-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 be color match to metal panels specified in Section 07 42 13.

2.6 HARDWARE

- A. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- B. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.7 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Construct with shear block system of assembly.
- D. Prepare components to receive anchor devices. Fabricate anchors.
- E. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- F. Arrange fasteners and attachments to conceal from view.
- G. Reinforce components internally for door hardware .
- H. Reinforce framing members for imposed loads.
- I. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

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. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

- J. Install operating sash.
- K. Set thresholds in bed of mastic and secure.
- L. Install hardware using templates provided.
- M. Install glass and infill panels in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- N. Install perimeter sealant in accordance with Section 07 90 05.
- O. 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 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

- A. Test installed storefront for water leakage in accordance with AAMA 501.2.
 - 1. Test a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect, before installation of interior finishes; test area may not show evidence of water penetration.

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. 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.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION

- A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 08 45 13 - STRUCTURED-POLYCARBONATE-PANEL ASSEMBLIES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes aluminum-framed assemblies glazed with translucent polycarbonate panels as follows:
 - 1. Canopy assemblies.
- B. Design, manufacture and installation of Standing Seam Monolithic Polycarbonate system. An assembly of extruded polycarbonate glazing panels incorporated into a complete aluminum framed system that has been tested and warranted by the manufacturer as a single source system.
- C. All anchors, brackets, and hardware attachments necessary to complete the specified structural assembly, weatherability and water-tightness performance requirements. All flashing up to but not penetrating adjoining work are also required as part of the system and shall be included.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.
- B. LEED Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
 - 3. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
- C. Shop Drawings: For panel assemblies.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
- D. Samples: In manufacturer's standard size.
 - 1. For each type of structured-polycarbonate panel.
 - 2. For each type of exposed finish for framing members.
- E. Delegated Design Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Qualification Data: For qualified installer.
- G. Product Test Reports: For each translucent polycarbonate-panel assembly, for tests performed by a qualified testing agency.
- H. Evaluation Reports: For translucent polycarbonate-panel assemblies from ICC-ES.
- I. Field quality-control reports.
- J. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Field Measurements: Where translucent canopy panels are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or fabrication workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - c. Water leakage.
 - d. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace translucent polycarbonate panels that exhibit defects in materials or workmanship within specified warranty period.
 - 1. Defects include, but are not limited to, the following:
 - a. Delamination.
 - b. Color changes exceeding requirements.
 - c. Losses in light transmission beyond 6 percent from original when measured after 10 years according to ASTM D 1003.
 - d. Warranty Period: 10 years from date of Substantial Completion.
 - e. Warranty Period for Hail Damage: Five years from date of Substantial Completion for hail stone penetration exceeding requirements.
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- D. Installer's Warranty: Installer agrees to repair or replace components of panel assemblies that fail in installation workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, installation defects and water leakage.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design translucent polycarbonate-panel assemblies.
- B. Structural Loads: As indicated on Drawings.

- C. Deflection Limits:
 - 1. Overhead Panel Assemblies: Limited to 1/60 of clear span for each assembly component of aluminum framing and panel joint in accordance with IBC Table 1604.3, footnote h.
- D. Structural-Test Performance: Panel assemblies tested according to ASTM E 330, as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified deflection limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Hail Stone Impact Resistance: Panel assemblies that resist penetration by hail stone smaller than 1-3/16 inch (30 mm) diameter, impacting panel surface at a final velocity up to 44 ft/sec (13.4 m/s) per ASTM E 822.
- F. Panel Clip Performance: Corrosion-resistant clips tested to meet a minimum 90 lb/sq. ft. (4.3 kPa) wind uplift when tested according to ASTM E 330.
- G. Panel Performance:
 - 1. Smoke-Developed Index: 450 or less according to ASTM E 84, or 75 or less according to ASTM D 2843.
 - 2. Flame Spread: 25 or less when tested according to ASTM E 84.
 - 3. Combustibility Classification: Class CC1 based on testing according to ASTM D 635.
 - 4. Thermal Aging: When exposed to 300 deg F (149 deg C) for 25 minutes, exterior panels tested in accordance with ASTM D 2244.
 - a. Color Retention: 0.75 (Hunter) units ?E maximum fade.
 - b. Color Darkening: 0.3 (Hunter) units ?L maximum.
 - c. Cracking or Crazing: None when exposed to 300 deg F (149 deg C) for 25 minutes.
 - d. Delamination: None when exposed to 300 deg F (149 deg C) and 0 deg F (-17.8 deg C) for 25 minutes.
 - e. Concentrated Loading: No damage while applying a load of 600 lbf (813.5 Nm) over 1 sq. ft. when tested according to OSHA, 29 CFR Section 1910.23(e)(8); and no damage while applying a load of 400 lbf (542.3 Nm) over 3 inches (152 mm) in diameter according to ASTM E 661.
- H. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- I. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 TRANSLUCENT POLYCARBONATE-PANEL ASSEMBLIES

- A. Translucent Polycarbonate-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with translucent polycarbonate panels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CPI Daylighting, Inc.; BriteWay-U-Lite or a comparable product by one of the following:

- a. DuoGard.
- b. Extech.
- c. Wasco.

2.3 TRANSLUCENT POLYCARBONATE CANOPY PANELS

- A. Translucent, Monolithic Solid Polycarbonate Panel Assembly: Consisting of monolithic, solid cross-section polycarbonate standing seam glazing panels with batten panel connectors, providing coextruded UV protection. Incorporate glazing panel system into a complete aluminum framed assembly.
- B. Monolithic Polycarbonate Panels: Extruded polycarbonate sheet (not cellular) that is coextruded with a UV-protective layer.
- C. Panel Thickness: Overall minimum 0.158 inch (4 mm).
- D. UV Resistance: Coextruded on exposed surfaces during glazing panel manufacture.
- E. Color:
 - 1. Monolithic, Solid Glazing Panel Color: As selected by Architect from manufacturer's full range.

2.4 ALUMINUM FRAMING SYSTEMS

- A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
- B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429 (/B 429M).
 - 4. Structural Profiles: ASTM B 308 (/B 308M).
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
- D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
 - 1. At closures, retaining caps, or battens, use ASTM A 193 (/A 193M), 300 series stainless-steel screws.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- E. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Exposed Flashing and Closures: Aluminum sheet not less than 0.040-inch (1.02-mm) thick, finished to match framing.
- G. Framing Gaskets: Manufacturer's standard gasket system with low-friction surface treatment designed specifically for retaining translucent polycarbonate panels.
- H. Frame-System Sealants: As recommended in writing by manufacturer.
 - 1. Sealant 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."

- I. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

- A. Fabricate aluminum components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Internal guttering systems or other means to drain water passing through joints and moisture migrating within assembly to exterior.
- B. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- C. Reinforce aluminum components as required to receive fastener threads.

2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat AAMA 2605, polyester finish. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, 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. General: Comply with manufacturer's written instructions.
 - 1. Do not install damaged components.
 - 2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 - 3. Rigidly secure nonmovement joints.
 - 4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
 - 5. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install components plumb and true in alignment with established lines and elevations.
- D. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:
 - 1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in-line, edge-to-edge, at corners, or where a reveal or protruding element separates

aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).

2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m), but no greater than 1/2 inch (12 mm) over total length.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove work where inspections indicate that it does not comply with specified requirements.
- B. Prepare inspection reports.

3.4 CLEANING

- A. Follow manufacturer's instructions when washing down exposed panel surfaces using a solution of mild detergent in warm water that is applied with soft, clean wiping cloths. Always test a small area before applying to the entire area.
- B. Follow strict panel manufacturer guidelines when removing foreign substances from panel surfaces requiring mineral spirits or any solvents that are acceptable for use.
- C. Installers shall leave panel system clean at completion of installation. Final cleaning is by others upon completion of project, following manufacturer's cleaning instructions.

END OF SECTION

SECTION 08 71 00**DOOR HARDWARE****PART 1 - GENERAL****1.01 SUMMARY****A. Section includes:**

1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
2. Electronic access control system components, including:
 - a. Electronic access control devices.
3. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

1.02 REFERENCES**A. UL - Underwriters Laboratories**

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.

B. Action Submittals:

1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
 - a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Quantity, type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.

- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.

- 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

- a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

- 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
- 2. Product data for electrified door hardware:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- 3. Certificates of Compliance:
 - a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
 - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.

- c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
- 4. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
 - 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Factory order acknowledgement numbers (for warranty and service)
 - d. Name, address, and phone number of local representative for each manufacturer.
 - e. Parts list for each product.
 - f. Final approved hardware schedule, edited to reflect conditions as-installed.
 - g. Final keying schedule
 - h. Copies of floor plans with keying nomenclature
 - i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.04 QUALITY ASSURANCE

- A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
 - 2. Can provide installation and technical data to Architect and other related subcontractors.
 - 3. Can inspect and verify components are in working order upon completion of installation.
 - 4. Capable of producing wiring diagrams.

5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
 - D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
 - E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
 - F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
 - G. Keying Conference
 1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
 - H. Pre-installation Conference
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.
 - I. Coordination Conferences:
 1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 - 2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 - 1. Promptly replace products damaged during shipping.
 - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years.
 - 2) Electrified: 2 years.
 - b. Automatic Operators: 2 years.
 - c. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - e. Continuous Hinges: Lifetime warranty.
 - f. Key Blanks: Lifetime
2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.08 MAINTENANCE

- A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series.
2. Acceptable Manufacturers and Products: Hager BB series, Bommer BB5000 series.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins

- c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

2.04 CONTINUOUS HINGES

A. Aluminum Geared

- 1. Manufacturers:
 - a. Scheduled Manufacturer: Ives.
 - b. Acceptable Manufacturers: Hager.
- 2. Requirements:
 - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
 - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
 - c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
 - d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
 - e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
 - f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
 - g. Install hinges with fasteners supplied by manufacturer.
 - h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

- A. Manufacturers:
 - a. Scheduled Manufacturer: Von Duprin EPT-10.
 - b. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10.
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage L9000 series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: Schlage 06A.

2.09 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Best 9K series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
 - a. Lever Design: Best 15 lever.

2.10 AUXILIARY LOCKS

A. Deadlocks:

1. Manufacturers and Products:
 - a. Scheduled Manufacturer and Product: Schlage L400 series.
 - b. Acceptable Manufacturers and Products: No substitution.
2. Requirements:
 - a. Provide mortise deadlock series conforming to ANSI/BHMA A156 and function as specified.
 - b. Cylinders: Refer to “KEYING” article, herein.
 - c. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
 - d. Provide manufacturer’s standard strike.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 99/33A series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer’s approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylindrical or hex-key dogging as specified at non fire-rated openings.
11. Provide dogging indicators (CDSI) for visible indication of dogging status.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.12 CYLINDERS**A. Manufacturers:**

1. Scheduled Manufacturer: Best.

B. Requirements:

1. Provide interchangeable cylinders/cores to match Owner’s existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.

C. Construction Keying:

1. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.

- b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.13 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Provide cylinders/cores keyed into Owner's existing factory registered keying system.
- C. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- D. Requirements:
 - 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
 - 2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 - 3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s).
 - 4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.
 - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
 - 5. Quantity: Furnish in the following quantities.
 - a. Change (Day) Keys: 3 per cylinder/core.
 - b. Permanent Control Keys: 3.
 - c. Master Keys: 6.

2.14 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer: Telkee.
2. Acceptable Manufacturers: No substitution.

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.15 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.16 ELECTRO-MECHANICAL CLOSER/HOLDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040SE/4310ME/4410ME series.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide single-point or multi-point hold-open electro-mechanical closer/holders as specified. Coordinate voltage requirements and provide transformer if necessary.
2. Provide multi-point electro-mechanical closer/holders with swing free arms.
3. Provide closer/holders that function as full rack and pinion door closer when current is interrupted or continuous hold-open is not engaged.
4. Provide door closers with fully hydraulic, full rack and pinion action with high strength cylinder and full complement bearings at shaft.
5. Cylinder Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
6. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
7. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
8. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
9. Pressure Relief Valve (PRV) Technology: Not permitted.
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN Senior Swing.
2. Acceptable Manufacturers and Products: No substitution.

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI/BHMA A156.19.
 - a. Opening: Powered by DC motor working through reduction gears.
 - b. Closing: Spring force.
 - c. Manual, hydraulic, or chain drive closers: Not permitted.
 - d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
 - e. Cover: Aluminum.
2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.

3. Provide drop plates, brackets, or adapters for arms as required to suit details.
4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
7. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.18 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.19 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
 - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.20 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS**A. Manufacturers:**

1. Scheduled Manufacturers: Glynn-Johnson.
2. Acceptable Manufacturers: ABH.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.21 DOOR STOPS AND HOLDERS**A. Manufacturers:**

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International.
2. Acceptable Manufacturers: National Guard, Reese.

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.23 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.24 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN.
2. Acceptable Manufacturers: Rixson.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.25 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage.
2. Acceptable Manufacturers: GE-Interlogix, Sargent.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.26 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.

3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
 - C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
 - D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
 - E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
 - G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
 - H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
 - I. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
 - K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
 - L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
 - M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
 - N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
 - O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

HARDWARE GROUP NO. 01

FOR USE ON MARK #(S):

A010

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	SURF. AUTO OPERATOR	9542 WMS	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853	630	LCN
2	EA	SURFACE MOUNT BOX	8310-867S	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8192AA	AA	ZER

NOTE: OPERATION OF OPENING- DURING SCHOOL HOURS, EXIT DEVICES TO BE DOGGED DOWN, ALLOWING FREE INGRESS/EGRESS. AUTO OPERATOR ACTIVATED BY PRESSING ACTUATOR ON EITHER SIDE OF OPENING. DURING NON-SCHOOL HOURS, DOORS NORMALLY CLOSED AND LOCKED. AUTO OPERATOR DEACTIVATED. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 02

FOR USE ON MARK #(S):

A010A B010A B010B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE	KR4954 STAB	689	VON
		MULLION			
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8192AA	AA	ZER

HARDWARE GROUP NO. 03

FOR USE ON MARK #(S):

XA04 XB01 XB03 XC11

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE	KR4954 STAB	689	VON
		MULLION			
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 03A

FOR USE ON MARK #(S):

XC34

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 04

FOR USE ON MARK #(S):

XA03

XA08

XB02

XC09

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	SD-QEL-XP99-NL-OP-110MD	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED.

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 04A

FOR USE ON MARK #(S):

XC36

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	SD-QEL-XP99-NL-OP-110MD	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED.

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 05

FOR USE ON MARK #(S):

A011 B011 C010

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	FIRE EXIT HARDWARE	9949-EO-F-LBL	626	VON
1	EA	FIRE EXIT HARDWARE	9949-L-BE-F-06-LBL	626	VON
2	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

NOTE: MAGNETIC HOLD OPENS TO BE TIED TO FIRE ALARM SYSTEM AND RELEASE
UPON ACTIVATION OF FIRE ALARM.

HARDWARE GROUP NO. 06

FOR USE ON MARK #(S):

B010

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	FIRE EXIT HARDWARE	9949-EO-F-LBL	626	VON
1	EA	FIRE EXIT HARDWARE	9949-L-BE-F-06-LBL	626	VON
1	EA	FIRE/LIFE CLOSER	4040SE MC WMS	689	LCN
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

NOTE: MAGNETIC HOLD OPENS TO BE TIED TO FIRE ALARM SYSTEM AND RELEASE
UPON ACTIVATION OF FIRE ALARM.

HARDWARE GROUP NO. 07

FOR USE ON MARK #(S):

A012 A022 B012 B022

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	FIRE EXIT	9949-EO-F-LBL	626	VON
		HARDWARE			
2	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
2	EA	MEETING STILE	8194AA 84" (2134MM)	AA	ZER

NOTE: MAGNETIC HOLD OPENS TO BE TIED TO FIRE ALARM SYSTEM AND RELEASE UPON ACTIVATION OF FIRE ALARM.

HARDWARE GROUP NO. 08

FOR USE ON MARK #(S):

A101 A102D A110B A122 A128 B108

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 09

FOR USE ON MARK #(S):

A101C A102 A112 A130 A222 B104
B106 C105 C122

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10

FOR USE ON MARK #(S):

A103	A105	A105A	A106	A107	A110
A113	A113A	A132	A201	A202	A204
A205	A208	A209	A210	A211	A220
A221	A227	B101AB	B101BB	B101C	B107
B108B	B109	B116	B118	B203	B206
B207	B208	B209	B210	B211	B211A
B211B	B213	B219	B220	B221	B222
C101A	C102	C102A	C114	C118	C119
C121	C127A	C201	C203	C205	

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 11

FOR USE ON MARK #(S):

A104	A214	A215	A216	A217	A223
B101CA	B103	B110	B112	B214	B215
B216					

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 12

FOR USE ON MARK #(S):

A109A	A111	A114	A114A	A116	A117
A119	A120	A123	A124	A125	A204B
B101BA	B108A	B201	C101	C106	C114A
C135	C207				

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 13

FOR USE ON MARK #(S):

A204A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 14

FOR USE ON MARK #(S):

B202

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 15

FOR USE ON MARK #(S):

C013A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 16

FOR USE ON MARK #(S):

C104

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP HEDA/62G	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 17

FOR USE ON MARK #(S):

C107

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 18

FOR USE ON MARK #(S):

C128

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 19

FOR USE ON MARK #(S):

A101A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	DOOR KNOB	9558 BY HAGER		HAG
1	EA	BI-FOLD DR HW	9570 SERIES BY HAGER	626	HAG

HARDWARE GROUP NO. 20

FOR USE ON MARK #(S):

C118A C118B C118C C118D C118E C118F

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM DEAD LOCK	L463HD L283-721	626	SCH
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	PUSH PLATE	8200 6" X 16"	626	IVE
1	EA	PULL PLATE	8302 8" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	FS495	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 21

FOR USE ON MARK #(S):

A102A B104A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	9K30N15	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 22

FOR USE ON MARK #(S):

A102B	A116A	A117A	A119A	A120A	A123A
A124A	A125A	A208A	A209A	A210A	A211A
A214A	A215A	A216A	A217A	A220A	A221A
B103A	B106A	B107A	B110A	B112A	B116A
B118A	B207A	B209A	B210A	B213A	B214A
B215A	B216A	B219A	B220A	B222A	C201A
C205A	C207A				

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	9K30N15	626	BES
1	EA	OH STOP	100S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 23

FOR USE ON MARK #(S):

B201A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	9K30N15	626	BES
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 24

FOR USE ON MARK #(S):

A108 A113AA C115 C202 C206

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FACULTY RESTROOM	L9485P 06A L583-363 L283-722	626	SCH
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 25

FOR USE ON MARK #(S):

C120A C123A C123B C135A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 26

FOR USE ON MARK #(S):

B020

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	WALL STOP	WS406/407CVX	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 27

FOR USE ON MARK #(S):

C103 C103A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 28

FOR USE ON MARK #(S):

C111 C134

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 29

FOR USE ON MARK #(S):

C204

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	MANUAL FLUSH BOLT	FB358	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	870AA-S	AA	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 30

FOR USE ON MARK #(S):

B101A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	BY ALUM DR MFG		B/O

HARDWARE GROUP NO. 31

FOR USE ON MARK #(S):

C116

C116A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE	KR4954 STAB	689	VON
		MULLION			
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 32

FOR USE ON MARK #(S):

C133 C133A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112HD	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
4	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	870AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA	AA	ZER

HARDWARE GROUP NO. 33

FOR USE ON MARK #(S):

B101G

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	99-L-BE-F-06	626	VON
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 34

FOR USE ON MARK #(S):

C012 C126 C127

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	9K37R15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 35

FOR USE ON MARK #(S):

C108 C109 C120 C123

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM DEAD LOCK	L463HD L283-721	626	SCH
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	PUSH PLATE	8200 6" X 16"	626	IVE
1	EA	PULL PLATE	8302 8" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 36

FOR USE ON MARK #(S):

C130

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 37

FOR USE ON MARK #(S):

S1.1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON
1	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	99-L-F-E996-06-FS	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

NOTE: OPERATION OF OPENING- DOOR NORMALLY LOCKED AND HELD OPEN BY MAGNETS. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER OR ACTIVATION OF FIRE ALARM, WALL MAGNETS RELEASE AND ELECTRIC TRIM OF EXIT DEVICE UNLOCKS (FAIL SAFE).

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 38

FOR USE ON MARK #(S):

S2.1

S2.2

S3.1

S3.2

S4.1

S4.2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON
1	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
1	EA	ELEC FIRE EXIT HARDWARE	99-L-F-E996-06-FS	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER OR ACTIVATION OF FIRE ALARM, DOOR UNLOCKS (FAIL SAFE).

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 39

FOR USE ON MARK #(S):

XA05 XC05

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224HD	628	IVE
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	LOCK GUARD	LG10	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	MEETING STILE	328AA-S	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 40

FOR USE ON MARK #(S):

XB20

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 41

FOR USE ON MARK #(S):

XC01A XC02A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	LD-XP99-EO	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	GASKETING	BY ALUM DR MFG		B/O
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 42

FOR USE ON MARK #(S):

C117 XC04

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH

HARDWARE GROUP NO. 43

FOR USE ON MARK #(S):

XC03 XC13 XC15 XC16 XC25 XC26

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	STOREROOM LOCK	9K37D15	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	LOCK GUARD	LG10	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 44

FOR USE ON MARK #(S):

XC01 XC02 XC06 XC08 XC14

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	QEL-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS-KL		VON

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED.

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 45

FOR USE ON MARK #(S):

XC07

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE ELEC STOREROOM LOCK	9K37DEU15 RQE	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED (FAIL SECURE).

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 46

FOR USE ON MARK #(S):

A101B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE ELEC STOREROOM LOCK	9K37DEU15 RQE	626	BES
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	LOCK GUARD	LG10	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS FA900-KL	LGR	SCE

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED (FAIL SECURE).

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 47

FOR USE ON MARK #(S):

XC08~PAIR

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	PANIC HARDWARE	CDSI- XP99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	SDQEL-XP99-EO	626	VON
1	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	THRESHOLD	656A-223	A	ZER
1	EA	CREDENTIAL READER	SUPPLIED BY OTHER		B/O
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS914 900-2RS-KL		VON

NOTE: OPERATION OF OPENING- DOOR NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY PRESENTING VALID CREDENTIALS AT READER. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER, DOOR REMAINS LOCKED.

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

HARDWARE GROUP NO. 49

FOR USE ON MARK #(S):

C110

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PANIC HARDWARE	CDSI-XP99-EO	626	VON
2	EA	PERMANENT CORE	TO MATCH EXISTING SYSTEM	626	BES
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 50

FOR USE ON MARK #(S):

S1.2

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-BE-F-06	626	VON
1	EA	MORTISE CYLINDER	20-061 ICX	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7830	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

NOTE: DOOR POSITION SWITCH CONNECTED TO ACCESS CONTROL SYSTEM

END OF SECTION

SECTION 08 80 00 - GLAZING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Glass.
- B. Glazing compounds and accessories.
- C. Insulated Aluminum Glazing Panel - Profiled.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
- I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- J. GANA (GM) - GANA Glazing Manual; 2009.
- K. GANA (SM) - GANA Sealant Manual; 2008.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 12 x 12 inch in size of glass units.
- E. Certificates: Certify that products meet or exceed specified requirements.
- F. Sustainable Design Submittals:
 - 1. Product data for Credit IEQ 4.1: For adhesives and sealants applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For glass, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For glass, if available: Material Ingredient Report.

3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied sealants and sealants primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- 1.4 QUALITY ASSURANCE
 - A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
- 1.5 MOCK-UP
 - A. Locate within framing set in masonry mock-up.
- 1.6 PRE-INSTALLATION MEETING
 - A. Convene one week before starting work of this section.
- 1.7 FIELD CONDITIONS
 - A. Do not install glazing when ambient temperature is less than 50 degrees F.
 - B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- 1.8 WARRANTY
 - A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
 - B. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
 - C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.1 GLAZING TYPES

2.2 EXTERIOR GLAZING ASSEMBLIES

- A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with (IBC) International Building code.
 1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 3. Thicknesses listed are minimum.

2.3 GLASS MATERIALS

- A. Float Glass Manufacturers:
 1. Cardinal Glass Industries: www.cardinalcorp.com.
 2. Guardian Industries Corp: www.sunguardglass.com.
 3. AGC Flat Glass North America: www.afgglass.com.
 4. Pilkington North America Inc: www.pilkington.com/na.
 5. PPG Industries, Inc: www.ppgideascales.com.
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
 - a. Where fully tempered or heat-strengthened as specified or required, provide glass that has been tempered by the tong-less horizontal method.
 3. Tinted Types: Color and performance characteristics as indicated.
 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.
- C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Interlayer:
 - a. Polyvinyl Butyral (PVB) Interlayer - Type G-2: 0.030 inch thick, minimum.
 - b. Ionoplast Interlayer - Type G-2B and Type G-3 (indoor lite): 0.035 inch thick, minimum.
 - 1) Basis-of-Design Interlayer Product: Kuraray Co., Ltd./DuPont™ SentryGlas® Ionoplast Interlayer.
 - c. Polyvinyl Butyral (PVB) Interlayer - Type G-6 (indoor lite): Translucent; 0.030 inch thick, minimum.
 - 1) Basis-of-Design: One layer 0.030 translucent polyvinyl butyral with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation equivalent to "Artic Snow 216500" by Solutia, Inc./Eastman Chemical Company or equivalent product of Kuraray Co., Ltd.
 - d. Polyvinyl Butyral (PVB) Interlayer - Type G-8 (indoor lite) and Type G-9 (indoor lite): Color; 0.030 inch thick, minimum.
 - 1) Basis-of-Design: One layer 0.030 translucent polyvinyl butyral with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation; color equivalent to Pulp Studio color PMS 2925.
 - 2) Other Available Manufacturers: Kuraray Co., Ltd. or Eastman Chemical Company.
 2. Where fully tempered or heat-strengthened as specified or required, provide glass that has been tempered by the tong-less horizontal method.
- D. Clear Float Glass : Clear, annealed.
1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 2. 6 mm minimum thick.
- E. Safety Glass : Clear; fully tempered with horizontal tempering.
1. Comply with 16 CFR 1201 test requirements for Category II.
 2. 6 mm minimum thick.
 3. Provide this type of glazing in the locations indicated on the drawings.

2.4 SEALED INSULATING GLASS UNITS

- A. Sealed Insulating Glass Unit Fabricators: Subject to acceptance of glass manufacturer and ability to attain warranty and comply with Contract Documents:
1. Any of the glass manufacturers with fabrication capabilities or fabricator in good standing with glass manufacturer including, but not limited to, one of the following.
 2. JE Berhowitz, L.P.
 3. Oldcastle Glass.

-
4. TGI, Inc.
 5. Viracon, Apogee Enterprises, Inc: www.viracon.com.
- B. Sealed Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Purge interpane space with dry hermetic air.
- C. Insulating Glass Units (Type G-3): Same as Type G-4 except provide indoor lite to be laminated glass with 0.060 ionoplast interlayer.
1. Outdoor lite remains Basis-of-Design product with same low-E coating on second surface.
- D. Insulated Glass Units (Type G-4): Double pane with glass to elastomer edge seal.
1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 2. Purge interpane space with dry hermetic air.
 3. Total unit thickness of 1 inch.
 4. Basis-of-Design - Clear Insulating Units: Guardian SuperNeutral 54 or equal or better product of other named manufacturers.
 - a. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
 - b. Interspace Content: Air.
 - c. Outdoor Lite: Class 1 (clear) float glass; Kind FT (fully tempered).
 - d. Indoor Lite: Class 1 (clear) float glass; Kind FT (fully tempered).
 - e. Low-E Coating: Second surface.
 - f. Visible Light Transmittance: 54 percent minimum.
 - g. Winter Nighttime U-Factor: 0.28 or better.
 - h. Summer Daytime U-Factor: 0.27 or better.
 - i. Solar Heat Gain Coefficient: 0.28 maximum.
 - j. Outdoor Visible Reflectance: 13 percent maximum.
- E. Insulated Glass Units (Type G-5): Double pane with glass to elastomer edge seal.
1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 2. Purge interpane space with dry hermetic air.
 3. Total unit thickness of 1 inch.
 4. Basis-of-Design - Clear Insulating Units: Guardian SuperNeutral 54 or equal or better product of other named manufacturers.
 - a. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
 - b. Interspace Content: Air.
 - c. Outdoor Lite: Class 1 (clear) float glass.
 - d. Indoor Lite: Class 1 (clear) float glass.
 - e. Low-E Coating: Second surface.
 - f. Visible Light Transmittance: 54 percent minimum.
 - g. Winter Nighttime U-Factor: 0.28 or better.
 - h. Summer Daytime U-Factor: 0.27 or better.
 - i. Solar Heat Gain Coefficient: 0.28 maximum.
 - j. Outdoor Visible Reflectance: 13 percent maximum.
- F. Insulated Glass Units (Type G-6): Double pane with glass to elastomer edge seal.
1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
 2. Purge interpane space with dry hermetic air.
 3. Total unit thickness of 1 inch.
 4. Basis-of-Design - Clear Insulating Units: Guardian SuperNeutral 54 or equal or better product of other named manufacturers.
 - a. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
-

- b. Interspace Content: Air.
 - c. Outdoor Lite: Class 1 (clear) float glass; Kind FT (fully tempered).
 - d. Indoor Lite: Class 1 (clear) laminated glass; Kind FT (fully tempered).
 - 1) Translucent interlayer; one layer 0.030 translucent polyvinyl butyral with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation equivalent to "Artic Snow 216500" by Solutia, Inc.
 - e. Low-E Coating: Second surface.
- G. Insulating Glass Units (Type G-7): Same as Type G-5 except provide indoor lite to be ceramic-coated (fourth surface) spandrel glass, ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.
- 1. Outdoor lite remains Basis-of-Design product with same low-E coating on second surface.
 - 2. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
- H. Insulating Glass Units (Type G-8): Same as Type G-4 except provide indoor lite to be laminated glass with color interlayer.
- 1. Outdoor lite remains Basis-of-Design product with same low-E coating on second surface.
- I. Insulating Glass Units (Type G-9): Same as Type G-4 except provide indoor lite to be laminated glass with color interlayer.
- 1. Outdoor lite remains Basis-of-Design product with same low-E coating on second surface.
- J. Sealing System: Dual seal, with primary and secondary sealants as follows:
- 1. Primary seal shall be extruded polyisobutylene continuously bonded to glass surfaces and desiccant filled metal spacer, including corners.
 - 2. Minimum width of primary seal shall be 0.125 inch (3.2 mm). Secondary seal shall be General Electric IGS 3723 or Dow Corning 982.
 - 3. Secondary seal shall completely cover spacer with no gaps or voids, and shall be continuously bonded to both plates of glass.
 - 4. Where insulating glass is supported by structural silicone, secondary seal shall be designed to transfer specified pressures from outdoor glass to indoor glass.
- K. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
- 1. Spacer Material: Stainless steel or thermally jacketed stainless steel.
 - 2. Desiccant: Molecular sieve or silica gel, or blend of both.
 - 3. Corner Construction: Manufacturer's standard corner construction.

2.5 FIRE-RATED GLAZING PRODUCTS

- A. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft.; and as follows:
- 1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Polished on both surfaces, transparent.
 - 3. Product: "FireLite Plus" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

B. Laminated Glass with Intumescent Interlayers:

1. At the Contractor's discretion, transparent wall product may be used instead of ceramic product; transparent wall panel products shall meet performance requirements specified for ceramic product.
2. Contractor must verify proper glazing stop width and heights for ratings, with the door and frame manufacturers.
3. Proprietary Category II safety glazing product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass laminated with intumescent interlayers; and as follows:
4. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
5. Product: Subject to compliance with requirements, "PyroStop" by Pilkington Building Products North America and distributed by Technical Glass Products.

2.6 GLAZING COMPOUNDS

- A. Butyl Sealant : Single component; Shore A hardness of 10 to 20; black color; non-skinning.
- B. Silicone Sealant : Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.
- C. Sealants applied within the building waterproofing envelope: Comply with low-emitting requirements specified in Section 01 61 16.

2.7 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products as follows:
 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; black color.

F. Glazing Clips: Manufacturer's standard type.

2.8 INSULATED ALUMINUM GLAZING PANEL - PROFILED

A. Product:

1. MapeShape by Mapes Industries, Inc.
2. Omega Foam Ply with modified profile by Laminators Inc.
3. GlazeGuard Infill Panel with modified profile by Citadel Architectural Products.

B. Laminated metal faced panels.

1. Finish: AAMA 2605; both surfaces.
 - a. Color:
 - 1) IP-1 Locations: Color match to aluminum framing and metal wall panels; 3-coat fluoropolymer.
 - 2) IP-2 Locations: Valspar 436R1030 Fluorpon L/G SR Regal Blue; 2-coat fluoropolymer.
2. Substrates:
 - a. Interior: High density tempered hardboard.
 - b. Exterior: High density polyethylene (HDPE).
3. Core: Isocyanurate.
4. Panel Thickness: As necessary to have flush face appearance to aluminum framing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Prime surfaces scheduled to receive sealant.
- C. Install sealants in accordance with ASTM C1193 and FGMA Sealant Manual.
- D. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.4 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Trim protruding tape edge.

3.5 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.6 MANUFACTURER'S FIELD SERVICES

- 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. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

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.

END OF SECTION

SECTION 08 91 00 - LOUVERS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Louvers, frames, and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers.

1.3 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.
- C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- 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.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For louvers, if applicable: Material Ingredient Report.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. 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. Airolite Company, LLC: www.airolite.com.
- B. All-Lite Architectural Products: www.alllite.com.

- C. Construction Specialties, Inc; Product RS-7315 (basis-of-design): www.c-sgroup.com.
- D. Greenheck Fan Corporation; www.greenheck.com.
- E. Industrial Louvers, Inc.: www.industriallouvers.com.
- F. Ruskin Company.

2.2 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
 - 1. 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.
 - 2. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 3. Screens: Provide bird screens.
- B. Deep Storm Resistant Fixed Horizontal Louver:
 - 1. Material: Heads, sills, jambs and mullions to be one-piece structural aluminum members with integral caulking slot and retaining beads.
 - 2. Design: Architectural line drainable sightproof storm resistant fixed-blade; designed to collect and drain water to exterior at sill by means of multiple gutters in blades and channels in jambs and mullions.
 - 3. Louvers to be supplied with 4 inches high by full depth sill flashings formed from minimum 0.050 inch thick aluminum; sill flashings to have welded side panels.
 - 4. Frame: 7 inches deep, channel profile; corner joints mitered and welded.
 - 5. AMCA Performance: (48 inches wide by 48 inches high test unit)
 - a. Free Area: Minimum 8.0 sq. ft.
 - b. Intake pressure drop at 900 fpm free area velocity: Minimum 0.32 in. H₂O.
 - c. Exhaust pressure drop at 900 fpm free area velocity: Minimum 0.44 in. H₂O.
 - 6. Wind Driven Rain Performance:
 - a. The louver test based on a 1.00m by 1.00m core area; unit tested at a rainfall rate of 3.0 inches per hour and with a wind directed to the face of the louver at a velocity 29.1-mph.
 - b. The test data to show the water penetration effectiveness rating at each corresponding ventilation rate.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), .
- B. Bird Screen: Interwoven wire mesh of steel, 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.
 - 1. Color: Custom, to match adjacent masonry.

2.4 ACCESSORIES

- A. Blank-Off Panels: Same material as louver, painted black on exterior side.
 - 1. Provide where indicated and where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

2. Uninsulated Panels: Provide at unconditioned spaces; minimum 0.050 inch thick aluminum sheet.
 3. Insulated Panels: Provide at conditioned spaces or where indicated.
 - a. 1 inch thick and faced on both sides with minimum 0.032 inch thick aluminum sheet.
 - b. Fabricated with an expanded polystyrene (EPS) core.
 - c. Panel perimeter frame to be 0.050 inch thick-formed aluminum channels; panel frame mitered at the corners.
 4. Finish: Same quality as louvers.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
1. Bird screens to be minimum 5/8 inch mesh, 0.050 inch thick expanded and flattened aluminum bird screen secured within minimum 0.055 inch thick extruded aluminum frames; frames to have mitered corners and corner locks.
- C. Glazing Adapter: Provide where louvers are glazed into storefront or curtainwall frames; minimum 0.090 inch thick extruded aluminum.
- D. Fasteners and Anchors: Stainless steel.
- E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- F. Sealant: ES-1 or ES-4 type, as specified in Section 07 90 05.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive 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. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Secure louver frames in openings with concealed fasteners.
- E. Install perimeter sealant and backing rod in accordance with Section 07 90 05.

3.3 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Shaft wall system.
- C. Fire rated area separation walls.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Gypsum wallboard.
- G. Glass mat faced gypsum board.
- H. Moisture and mold resistant wallboard.
- I. Impact-resistant gypsum board.
- J. Joint treatment and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- D. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- E. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- G. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.
- H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- J. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- K. GA-216 - Application and Finishing of Gypsum Board; 2013.
- L. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2008.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- C. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
- D. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations

- a. For gypsum board and steel framing: Product-specific declaration or Industry-wide EPD or product-specific EPD.
2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content gypsum board and steel framing: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced gypsum board and steel framing: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - c. 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 gypsum board, sound attenuation blanket, joint compound, if available: 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 v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- E. Submit drawings indicating proposed location of control joints for Architect's review; locations to be approved by Architect and may be adjusted for aesthetic reasons.

1.4 QUALITY ASSURANCE

- A. Maintain one copy of all installation standards at project site.
- B. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
 1. Maintain one copy of standards at project site.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
 1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies identical to those tested in assembly indicated.

2.2 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 1. CertainTeed Corporation: www.certainteed.com/#sle.
 2. Continental Building Products: www.continental-bp.com/#sle.
 3. Georgia-Pacific Gypsum LLC: www.gp.com/gypsum.
 4. Lafarge North America: www.lafarge.com.
 5. National Gypsum Company: www.nationalgypsum.com/#sle.
 6. USG Corporation: www.usg.com/#sle.

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- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Regular Type:
 - a. Application: Use for vertical surfaces, unless otherwise indicated.
 - b. Edges: Tapered.
 - c. Recycled Content: Provide regular type gypsum panel products with minimum 80 percent recycled content, including recycled content face paper; provide Type X with minimum 10 percent recycled content.
 2. Fire Resistant Type: Complying with Type X requirements; UL or WH rated.
 - a. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
 - b. Edges: Tapered.
 3. Ceiling Board: Special sag-resistant type.
 - a. Application: Ceilings, except areas with showers or otherwise indicated.
 - b. Thickness: 1/2 inch.
 - c. Edges: Tapered.
- C. Impact Resistant Wallboard:
1. Application: Shaft-wall assemblies and where Drawings indicate impact- or abuse-resistant gypsum wallboard..
 2. Surface Abrasion: 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 7. Type: Fire resistance rated Type X, UL or WH listed.
 8. Thickness: 5/8 inch.
 9. Edges: Tapered.
 10. Products:
 - a. Continental Building Products; Protecta HIR 300 Type X with Mold Defense.
 - b. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant.
 - c. National Gypsum Company; Gold Bond HI-Impact XP Gypsum Board.
 - d. National Gypsum Company; Gold Bond eXP Interior Extreme IR Gypsum Panel.
- D. Moisture and Mold Resistant Wallboard: Wallboard installed at building perimeter, and any wallboard furred to concrete or masonry construction.
1. Characteristics:
 - a. ASTM C 1396 (Section 5) regular type except where Type X fire-resistant type is indicated or required by to meet UL assembly types.
 - b. Edges: Tapered.
 - c. Resists the growth of mold when tested, as manufactured, according to ASTM D 3273.
 2. Available Products:
 - a. SHEETROCK® Brand Mold Tough® Gypsum Panels by USG.
 - b. Gold Bond® BRAND XP® Wallboard by National Gypsum.
 - c. Mold Defense Products by LaFarge.

2.3 FIBERGLASS REINFORCED BOARD MATERIALS

- A. Glass Mat Gypsum Board: Gypsum panels with moisture-resistant core and coated inorganic fiberglass mat back surface designed to resist growth of mold and mildew, per ASTM D 3273.
 - 1. Glass Mat Board: Comply with performance requirements of ASTM C 1396/C 1396M for water-resistant gypsum backing board and ASTM C 1177/C 1177M for sheathing; tapered long edges.
 - 2. Application: High-humidity or wet locations; walls or ceilings; high-humidity or wet locations include kitchen areas and adjacent service areas, areas with showers, janitor basins, gang toilets, mechanical penthouses and mechanical spaces with steam, hot water or condensation generating equipment.
 - a. Available Products:
 - 1) DensArmor Plus Interior Guard by G-P Gypsum.
 - 2) EXP Extreme by National Gypsum.
 - 3. Application: Sheathing.
 - a. Basis-of-Design: Dens-Glass Gold Exterior Guard by G-P Gypsum; Type X.
 - b. Other Available Products: CertainTeed GlasRoc Brand Sheathing; Type X, e2xp Extended Exposure Sheathing by National Gypsum Company.
 - 4. Application: Shaftwall.
 - a. Basis-of-Design: Dens-Glass Ultra Shaft Guard by G-P Gypsum.
 - b. Contractor Option: The contractor may provide the following instead of Basis-of-Design Product.
 - 1) Fire-Shield Shaftliner XP panels by National Gypsum.
 - 2) Sheetrock Brand Gypsum Liner Panels Mold Tough by USG.
 - 5. Application: Exterior soffits.
 - a. Available Products:
 - 1) Dens-Glass Gold Exterior Guard by G-P Gypsum.
 - 2) CertainTeed GlasRoc Brand Sheathing.
 - b. Core: 5/8 inch, Type X.
 - c. Finish: G-P Setting Compound followed by G-P Finish Coat.
- B. Sheathing Joint and Penetration Treatment:
 - 1. Silicone Emulsion Sealant: ASTM C 834, compatible with sheathing tape and sheathing, recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

2.4 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
- B. Thickness as scheduled by partition schedule by dimension or STC assembly.
- C. Acoustic Insulation: 1; preformed glass fiber, friction fit type, unfaced.
- D. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
 - 1. Comply with low-emitting requirements specified in Section 01 81 13.
- E. Finishing Accessories: ASTM C1047, galvanized steel or plastic paper-faced, unless otherwise indicated.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Available products include the following:
 - a. Grabber Construction Products: No-Coat Prefinished Corners.
 - b. US Gypsum Company; Beadex Paper-Faced Metal Drywall Bead and Trim.

- F. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
 - 1. Joint Tape: Paper for interior applications; 10-by-10 glass mesh for exterior locations and glass mat gypsum wallboard; 2 inch wide.
 - 2. Ready-mixed vinyl-based joint compound.
- G. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- H. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.
- I. Adhesives Applied within the Building Waterproofing Envelope: Comply with low-emitting requirements specified in Section 01 61 16.
- J. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 - 3. Finish:
 - a. Corrosion-resistant primer compatible with joint compound and finish materials specified.
 - b. Silicone polyester enamel finish coat; custom color to be selected.
 - 4. Reveals, Trims and Molding: As indicated on Drawings.

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 Framing: Install in accordance with manufacturer's installation instructions.
 - 1. Install studs at spacing required to meet performance requirements.
- B. 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.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 BOARD AND GLASS MAT FACED BOARD INSTALLATION

- A. Comply with ASTM C 840 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.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.

- 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. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 - 1. Cut boards at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 - a. Install boards with a 3/8-inch setback where non-load-bearing construction abuts structural elements.
 - b. Install boards with a 1/4-inch setback where they abut masonry or similar materials that might retain moisture, to prevent wicking.
 - 2. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
 - 3. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
 - 4. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
 - 5. Screw-attach boards at perimeter and within field of board to each steel stud; space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 6. Seal sheathing joints according to sheathing manufacturer's written recommendations.
 - a. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape.
 - b. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
 - c. Seal other penetrations and openings.
- F. Exterior Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.
 - 3. Apply glass-fiber tape to glass mat faced gypsum board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape.
 - 4. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered.
 - 5. Seal other penetrations and openings.
 - 6. Prepare for specified finish according to manufacturer's instructions.
- G. Glass Mat Faced Gypsum Board: Install in strict accordance with manufacturer's instructions.
- H. Installation on Metal Framing: Use screws for attachment of all gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.
- I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:

1. Not more than 30 feet 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 and as indicated.

3.6 JOINT TREATMENT

- A. 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.
- B. 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 5: Walls and ceilings to receive Decorative Semi-Rigid Wall Covering, semi-gloss or gloss paint finish and other areas specifically indicated.
 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
 5. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.7 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 22 16 - 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 SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, limitations, and head to structure connectors, showing compliance with requirements.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For gypsum board and steel framing: 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 framing and suspension systems: 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, purchase of recycled raw materials.
- 3. MR Credit 4: BPDO - Material Ingredients
 - a. For steel framing and suspension systems, if available: Material Ingredient Report.

1.4 PROJECT CONDITIONS

- A. Coordinate the placement of components to be installed within stud framing system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC; Product ____: www.clarkdeitrich.com.
 - 2. Dietrich Metal Framing: www.dietrichindustries.com.
 - 3. Marino: www.marinoware.com/#sle.
- B. Slip-Type Head Joints:
 - 1. Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 2. Superior Metal Trim; Superior Flex Track System (SFT).
 - 3. Dietrich Metal Framing; Fast Top Clip.
- C. Firestop Tracks:
 - 1. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - 2. Metal-Lite, Inc.; The System.
 - 3. Clark Western; Brady's Sliptrack within UL assembly.
 - 4. Dietrich Metal Framing; SLP-TRK within UL assembly.
- D. Metal Back-up Plates:
 - 1. Metal Lite, Inc., Anaheim, CA.
- E. Grid Suspension System for Gypsum Board Ceilings and Bulkheads:
 - 1. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - 2. Chicago Metallic Corporation; Drywall Furring System.
 - 3. USG Corporation; Drywall Suspension System.

2.2 FRAMING MATERIALS

- A. Recycled Content: Provide steel with at least 25 percent post-consumer recycled content.
- B. Regional Materials: Provide at least 25 percent of steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- 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.
 - a. Typical: Minimum 0.0283 inch, 22 gage (27 mil) except when reference standard states a more stringent requirement.
 - b. At door and glazed opening jambs, and framing supporting ceramic tile: Minimum 0.0312 inch, 20 gage (30 mil) except when reference standard states a more stringent requirement.
 - c. Note: The Architect will accept "Effective Thickness" listed UltraSTEEL Framing, with independent test data.
 - 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 40 00.
- 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 North American Specification for the Design of Cold-Formed Steel Structural Members.
 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.
 4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
- G. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs .
- 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: Power actuated.
- L. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
- M. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
 1. Comply with low-emitting requirements specified in Section 01 81 13.
- N. 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 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure where indicated and to ceiling in other locations.
- C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. 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.
- E. Align and secure top and bottom runners at 24 inches on center.

- F. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Install studs vertically at spacing indicated on drawings.
- I. Align stud web openings horizontally.
- J. Secure studs to tracks using crimping method. Do not weld.
- 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. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- O. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- P. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.
- Q. Provide metal backup plates as required to accommodate the wall hung casework, millwork, railings or other items mounted to metal stud and wallboard walls and partitions; provide plates up to 8 feet in length as one-piece units.

3.2 CEILING AND SOFFIT FRAMING

- A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- B. Install furring independent of walls, columns, and above-ceiling work.
- C. 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.
- D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- G. 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.
- H. Laterally brace suspension system.
- I. Contractor Option - Grid Suspension System for Gypsum Board Ceilings and Bulkheads: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

3.3 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 30 00 - TILING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Stone thresholds.
- E. Ceramic trim.
- F. Waterproofing and crack isolation membrane.

1.2 REFERENCE STANDARDS

- A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.
 - 1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
 - 2. 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; 1999 (Reaffirmed 2010).
 - 3. 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; 1999 (Reaffirmed 2010).
 - 4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
 - 5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
 - 6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
 - 7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
 - 8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
 - 9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
 - 10. ANSI A108.11-SystemDeleted - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).
 - 11. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
 - 12. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
 - 13. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

14. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Revised).
 15. ANSI A118.9-SystemDeleted - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).
 16. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.
- B. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
- G. Product data for Credit IEQ 4.2: For sealers applied within the building water proofing envelope, documentation including printed statement of VOC content in g/L.
- H. LEED Submittals: Comply with Section 018113.
 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For tile and grout, if available: Industry-wide or product-specific EPD.
 2. MR Credit 4: BPDO - Material Ingredients
 - a. For grout, cement board, and waterproofing membrane, if available: Material Ingredient Report.
 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesive, grout, grout sealer, sealants, primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For interior wet-applied waterproofing membrane: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010.

1.4 QUALITY ASSURANCE

- A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.

1.5 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

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 adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.8 EXTRA MATERIALS

- A. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than one box of each type.
- B. Turn over any cut tile exceeding 50 percent of a full tile, as extra materials.

PART 2 PRODUCTS

2.1 TILE

- A. Glazed Wall Tile : ANSI A137.1, and as follows:
 - 1. Moisture Absorption: 3.0 to 7.0 percent.
 - 2. Size and Shape: 6 inch square.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: Semi-gloss, unless specifically noted to be Matte Finish.
 - 5. Colors: Maximum 6 colors. As selected from manufacturer's full product line including all price groups. A maximum 50 percent of wall tile will be selected from the highest price group.
 - 6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.
 - 7. Available Manufacturers:
 - a. Basis-of-Design: Daltile Corporation.
 - b. American Olean.
 - c. Florida Tile Industries.
 - d. Interceramic, USA.
- B. Ceramic Mosaic Tile: ANSI A137.1, and as follows:
 - 1. Moisture Absorption: 0 to 0.5 percent.
 - 2. Coefficient of Friction: ASTM C1028.
 - a. Wet: 0.60 or greater.
 - b. Dry: 0.80 or greater.
 - 3. Size and Shape: 2 inch square.
 - 4. Edges: Square.
 - 5. Surface Finish: Unglazed.
 - 6. Colors: To be selected by Architect from manufacturer's full range.
 - 7. Manufacturers:
 - a. Classic Mosaics or Color Blox Mosaics by Crossville Inc.
 - b. Keystones by Dal-Tile.
 - c. Unglazed ColorBody Porcelain Mosaics by American Olean.
- C. Quarry Tile : ANSI A137.1, and as follows:
 - 1. Moisture Absorption: 0.5 to 3.0 percent.
 - 2. Size and Shape: 8 inch square.
 - 3. Thickness: 3/4 inch.
 - 4. Edges: Square.
 - 5. Surface Finish: Unglazed.

6. Colors: To be selected by Architect from manufacturer's full range including all price groups. A maximum 50 percent of floor tile will be selected from the highest price group.
7. Trim Units: Matching cove base shapes in sizes coordinated with field tile.
- D. Porcelain Floor and Base Tile: ANSI A137.1, conforming to the following:
 1. Moisture Absorption: 0 to 0.5 percent.
 2. Breaking Strength: ASTM C648; greater than 300 pounds.
 3. Coefficient of Friction: ASTM C1028.
 - a. Wet: 0.60 or greater.
 - b. Dry: 0.80 or greater.
 4. Size (Floor): 8 x 8 x 5/16 inch.
 5. Size (Base): 6 x 12 x 5/16 inch; 4 x 12 x 5/16 inch at locker base locations.
 6. Shape: Square.
 7. Edge: Cushioned.
 8. Surface Finish: Unglazed.
 9. Basis-of-Design: Cross-Colors by Crossville, Inc. or Porcelato by Dal-Tile.
 10. Color: As selected from manufacturer's full product line including all price groups. A maximum 50 percent of floor tile will be selected from the highest price group.

2.2 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
 1. Applications: Use in the following locations:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 - c. Floor to Wall Joints: Cove base.
 2. Manufacturer: Same as for tile.
- B. Thresholds: Marble, gray, honed finish; 5 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. Applications: Provide at the following locations:
 - a. At doorways where tile terminates, unless indicated otherwise.
 - b. At open edge of shower stalls using ceramic mosaic tile as basin.

2.3 SETTING MATERIALS

- A. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Products:
 - a. Custom Building Products: www.custombuildingproducts.com.
 - b. Bonsal American, Inc: www.sakrete.com.
 - c. Bostik Inc: www.bostik-us.com.
 - d. MAPEI Corporation.
 - e. TEC Specialty Products, Inc.

2.4 GROUTS

- A. Manufacturers:
 1. Bonsal American, Inc: www.sakrete.com
 2. Bostik Inc: www.bostik-us.com/#sle.
 3. Custom Building Products: www.custombuildingproducts.com.
 4. MAPEI Corporation.

5. TEC Specialty Products, Inc.
- B. 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.

2.5 THIN-SET ACCESSORY MATERIALS

- A. Adhesives, grout, grout sealer, sealants, waterproofing membrane, and primers applied within the building waterproofing envelope: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- B. Waterproofing and Crack Isolation Membrane: Fluid-applied acrylic-based membrane with reinforcing mesh, complying with ANSI A118.10.
 1. Basis-of-Design: Mapei Corporation; Mapelastic HPG with Fiberglass Mesh.
 2. Equivalent product of listed setting and grouting material manufacturers.
 3. Location: All tile floors; full coverage.
- C. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
 1. Product: Durock Brand Cement Board manufactured by United States Gypsum Company.
 - a. Contractor Option: PermaBase Brand Cement Board, by National Gypsum Company.
 2. Location: Wet walls and high-humidity areas (not required at corridor locations).
- D. Metal Edge Strips:
 1. Open Edge of Tile with Adjacent Finish of Similar Height:
 - a. General: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.
 - b. Basis-of-Design: 1.1 Schluter-SCHIENE Edge-protecting Profile; stainless steel.
 2. Open Edge of Tile with Adjacent Finish of Different Height:
 - a. General: ADA-compliant profile, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.
 - b. Basis-of-Design:
 - 1) 1.2 Schluter-RENO-U Reducer Profile, where tile surface is higher than adjacent finish; stainless steel.

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 tile.
- 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 tile.

- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

3.3 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook 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 joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install thresholds where indicated.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- I. Allow tile to set for a minimum of 48 hours prior to grouting.
- J. Grout tile joints. Use standard grout unless otherwise indicated.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Provide specified waterproofing and crack isolation membrane for all tile floor areas; install in accordance with TCA Method F122, with latex-portland cement grout.

3.5 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Freezer/Cooler Quarry Tile - Thick Set with Reinforcement and Waterproofing: Install by conventional bed TCA Handbook Method F121; epoxy grout.
- B. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

3.6 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At tiled shower receptors install in accordance with The Tile Council of North America Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit

walls. Latex-Portland cement mortar bond coat with latex-Portland cement grout.
Waterproof membrane turned up walls a minimum of 6 inches above finished floor.

3.7 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244, using membrane at toilet rooms.
- B. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202, thin-set with dry-set or latex-Portland cement bond coat.
- C. Shower Walls:
 - 1. Over interior concrete and masonry install in accordance with TCA Handbook Method W211, bonded mortar bed with latex-Portland cement bond coat; with latex-Portland cement grout.
 - 2. Include waterproofing membrane over mortar bed of W211.

3.8 CLEANING

- A. Clean tile and grout surfaces.

3.9 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
- C. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 09 51 00 - ACOUSTICAL CEILINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Lay-in metal panels; perforated with acoustical backing.

1.2 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- B. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- C. UL (FRD) - Fire Resistance Directory; current edition.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items; show the following:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching suspension system hangers to building structure.
 - 3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 ft.
- C. Product Data: Provide data on suspension system components.
- D. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For acoustical ceiling panels and steel suspension system, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 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.
 - 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 acoustical ceiling panels and steel suspension system, if available: Material Ingredient Report.
 - 4. EQ Prerequisite 3: Minimum Acoustic Performance
 - a. For acoustic ceiling systems in all Core Learning Spaces: Documentation indicating the Noise Reduction Coefficient (NRC) demonstrating minimum 0.70 NRC.
 - 5. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied acoustical sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.

1.4 QUALITY ASSURANCE

- A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.

1.5 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.6 PROJECT CONDITIONS

- 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. Install acoustical units after interior wet work is dry.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 12 cases.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. USG: www.usg.com.
- B. Acoustical Units - General: ASTM E1264, Class A.
 - 1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly the suspension system is a part of.
- C. Ceiling System Acoustical Performance in Core Learning Spaces: Provide minimum NRC 0.70 rating.

2.2 LAY-IN METAL PANELS

- A. Basis-of-Design: Lay-in Metal Panels by Gordon Interior Specialties Division.
- B. Other Available Manufacturers: Subject to compliance with specifications and comparison to Basis-of-Design.
 - 1. Armstrong.
 - 2. Hunter Douglas Architectural Products, Inc.
- C. Panel Size: 24 x 24 inches.
- D. Edge Type: Square edge.
- E. Panel Finish: Gordon GreenWood Wood Grain Film, or accepted equivalent of other named manufacturers.
- F. Perforations: 1/16-inch round holes on 1/4-inch diagonal centers.
- G. Acoustic Material: 1" thick glass fiber, 1 1/2 pcf density, enclosed in black polyethylene.

2.3 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Chicago Metallic Corporation: www.chicagometallic.com.
 - 4. Gordon Interior Specialties Division: www.gordon-inc.com.
 - 5. USG: www.usg.com.
- B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.
- C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty and intermediate-duty as scheduled.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White painted.
- D. Exposed Steel Suspension System - Metal Panel Locations: Similar to other exposed suspension system with integral gasket, to assist in reducing metal pan rattle; Armstrong ES7901 and ES7920 or equivalent of other named manufacturers. Custom color to be selected.
- E. Recycled Content: Provide steel with minimum 25 percent post-consumer recycled content.

2.4 EXTRUDED PERIMETER TRIM

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc; Product Axiom: www.armstrong.com.
 - 2. Chicago Metallic Corporation; Product Infinity: www.chicagometallic.com.
 - 3. USG; Product Compasso: www.usg.com.
- B. Location:
 - 1. Edge trim system for transitions between drywall and suspended ceilings.
 - 2. Boundry trim system for isolated hung areas of suspended ceilings.
- C. Components:
 - 1. Height: 4 inches.
 - 2. Extruded aluminum alloy 6063 trim channel.
 - 3. Attachment to grid system is provided by tee-bar connection clips which lock into bosses on the trim channel and are screw-attached to the web of the intersecting suspension system members.
 - 4. Sections of trim are joined together using the splice plate.

2.5 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.
- C. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 90 05 and low-emitting requirements as specified in Section 01 81 13.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636, ASTM E 580, 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. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- 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. Install in bed of acoustical sealant.
 - 2. Use longest practical lengths.
 - 3. Overlap and rivet corners.
- K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.2 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. Lay directional patterned units with pattern parallel to longest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install units after above-ceiling work is complete.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges.
 - 3. Double cut and field paint exposed reveal edges.
- H. Where round obstructions occur, provide preformed closures to match perimeter molding.
- I. Install hold-down clips on panels within 20 ft of an exterior door.

3.3 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.

3.4 SCHEDULE

- A. Acoustical Panels Type APC-1 and APC-2: ASTM E1264, Type III, Form 2; conforming to the following:
 - 1. Thickness: 3/4 inch.
 - 2. Composition: Mineral.
 - 3. Light Reflectance: 0.84 or better; ASTM E1477.
 - 4. NRC Range: 0.70 or better; ASTM C423.
 - 5. Edge: Square.
 - 6. Surface Color: White.
 - 7. Surface Finish: Non-directional fine texture.
 - 8. Shall withstand combined effects of temperatures to 104 degrees F and relative humidity to 90 percent without visible sag.
 - 9. Ten-year warranty for sag resistance.
 - 10. Basis-of-Design Products:
 - a. Armstrong World Industries, Inc., Fine Fissured Item #1713 (2'x2')/1714 (2'x4').
 - b. USG Interiors, Inc., Radar ClimaPlus Item #22111 (2'x2')/22541 (2'x4').
 - c. CertainTeed Ceilings, Fine Fissured HHF-457 HNRC (2'x2')/HHF-497 HNRC (2'x4').
 - 11. Size:
 - a. APC-1: 24 inches x 48 inches.
 - b. APC-2: 24 inches x 24 inches.
 - 12. Grid: Intermediate-duty 15/16-inch exposed face.
- B. Acoustical Panels Type APC-3 for Food Service support areas as scheduled: ASTM E1264, Type XX, Pattern G; conforming to the following:
 - 1. Thickness: 1/2 inch.
 - 2. Core Composition: Gypsum.
 - 3. Finished Surface: CRF Vinyl
 - 4. Light Reflectance: 0.78 or better; ASTM E1477.
 - 5. Edge: Square.
 - 6. Surface Color: White.
 - 7. Shall withstand combined effects of temperatures to 104 degrees F and relative humidity to 90 percent without visible sag.
 - 8. Ten-year warranty for sag resistance.
 - 9. Basis-of-Design Product:
 - a. CertainTeed, Vinylrock.
 - b. Equal Product by one of the following:
 - 1) Armstrong World Industries, Inc.
 - 2) USG Interiors, Inc.
 - 10. Size: 24 inches x 24 inches.
 - 11. Grid: Intermediate-duty 15/16-inch exposed face.
- C. Lay-in Metal Panel Type: Refer to Part 2 for selection.

END OF SECTION

SECTION 09 52 50 - INTERACTIVE ACOUSTICAL PANEL SYSTEM**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes sound-absorbing and sound-diffusing acoustical panels for the instrumental and general music rooms.
- B. Related Sections include the following:
 - 1. Division 9 Section "Acoustical Panel Ceilings" for acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.
 - 2. Division 9 Section "Acoustical Wall Panels" for shop-fabricated panels for other locations.

1.2 SYSTEM DESCRIPTION

- A. Provide a system of sound-absorbing and sound-diffusing panels for reducing sound energy levels and improving the hearing environment.
- B. Absorber panels (Type AP-3): Wall- and ceiling-mounted, impact resistant; sound absorbing throughout audio spectrum; fabric-wrapped.
- C. Small Diffuser Panels (Type AP-4) - less than 24 sq. ft. in size): Wall-mounted; impact resistant cylindrical section with two faceted ends; fabric-wrapped.
- D. Large Diffuser Panels (Type AP-5) - greater than or equal to 24 sq. ft. in size): Wall-mounted; impact resistant cylindrical section with two faceted sides; sound absorbing material mounted on rear surface; fabric-wrapped.
- E. Ceiling Diffuser Panels (Type SATC-1): Ceiling-mounted, impact resistant cylindrical section with two faceted sides, white finish.
- F. Mounting Hardware:
 - 1. Wall Mounting (Absorbers and Diffusers): Mount with concealed metal brackets, designed to allow panels of same size to be interchanged. Provide 2-inch clearance above top of absorbers and diffusers as required for proper mounting.
 - 2. Ceiling Mounting (Absorbers and Standard Diffusers): Mount with four corner hooks suspended by wire ceiling. Provide with lay-in hardware for ceiling grid mounting or direct ceiling mounting.
- G. Acoustical Performance Requirements;
 - 1. Airborne Noise Reduction: Provide acoustical absorber and diffuser panels in layout designed by computer simulation based on Fitzroy formulas to provide the following sound reduction:
 - a. Instrumental Music: 0.82 dB +/- 0.5dB.
 - b. Vocal Music: 1.26 dB +/- 0.5dB.
 - 2. Reverberation Time: Provide acoustical absorber and diffuser panels in layout designed by computer simulation based on Fitzroy formulas to provide the following reverberation times:
 - a. Instrumental Music: 3.68 +/- 0.2 seconds.
 - b. Vocal Music: 2.28 +/- 0.2 seconds.

1.3 SUBMITTALS

- A. Product Data: For each type of acoustical wall panel specified.

- B. Shop Drawings: Indicate fabrication and installation of acoustical wall panels including plans, elevations, sections, details of components, and attachments to other construction. Include elevations showing acoustic room components sizes, arrangements, and details of each condition of installation. Show fabrication and installation details.
1. Indicate variations from basis of design unit sizes and layout shown on drawings, based upon performance of proposed products.
 2. Provide acoustic engineering calculation results based on a full acoustical analysis using octave band frequencies from 125Hz to 4,000 Hz and a graphic representation of each room's acoustical properties prior to and after installation of acoustical room components.
 - a. Base calculations on proposed supplier's specific products.
 - b. Diffusion is necessary to prevent hot spots and dead spots, and to appropriately blend and mix sound therefore the acoustical design MUST include diffusive devices on each wall and in the ceiling.
 - c. Indicate absorption and reverberation time properties complying with design requirements, utilizing octave band frequencies from 125 Hz to 4,000 Hz, based upon Fitzroy formulas.
 - d. Show room response at 125 to 4000 Hz octave bands a.) empty; b.) untreated and occupied; and c.) treated and occupied. Failure to submit these calculation data will result in rejection of the proposed supplier's product.
 - e. Calculations based upon NRC data alone do not meet the requirements of this specification. Submission of data sheets indicating coefficients of absorption for various products does not constitute an analysis, nor does NRC-value comparisons of one product to another.
 - f. The specifier will not address product comparisons to determine equality. Only the analysis that is submitted prior to bidding, per instructions, will determine acceptability.
- C. Samples for Initial Selection: Submit 12-inch-square units of each type of acoustical panel required and in each color, texture, and pattern for facing materials. Include representative samples of installation devices and accessories.
- D. Samples for Verification: Full-size units of each selected color and pattern of acoustical panel required.
- E. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.
- F. Maintenance Data: For interactive acoustical panel system to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Acoustical Wall Panels: Obtain each color, grade, finish, type, and variety of acoustical wall panels from one source with resources to provide products of consistent quality in appearance and physical properties.
- B. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical wall panels with appropriate markings of applicable testing and inspecting agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

- C. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in manufacture of acoustic room components.
 - 1. Manufacturers must submit the following:
 - a. Acoustical analysis and proposed layout for this project as described in Submittals Article above.
 - b. Samples of each component of product specified, when requested by Architect.
 - c. Project references: Minimum of 5 installations not less than 5 years old, with owner contact information.
 - d. Sample warranty.
 - 2. Approved manufacturers must meet separate requirements of Submittals Article.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect interactive acoustical wall panels from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation.
- B. Do not deliver material to building until wet-work has been completed and cured to a condition of equilibrium.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not begin installation until spaces for acoustical wall panels have been enclosed and maintained at approximately the same humidity and temperature conditions as planned for occupancy. Maintain temperature and humidity as recommended by panel manufacturer.
- B. Field Measurements: Check actual wall surfaces by accurate field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating acoustical wall and ceiling panels without field measurements. Coordinate wall and ceiling construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 Specifications.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of interactive acoustical panel system components that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: 3 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Absorber Panels: Full-size units equal to 2 percent of amount installed, but no fewer than 4 units.
 - 2. Diffuser Panels: Full-size units equal to 1 percent of amount installed for each size and type indicated, but no fewer than 4 units of each size and type.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for interactive acoustical panel system is based on Wenger Corporation; Interactive Acoustical Panel System. Subject to compliance with requirements, and giving preference to products having recycled content, provide the named product or a comparable product by one of the following:
1. Conwed; Respond Wall and Ceiling Diffusers.
 2. Kinetics Noise Control; Modified Hardside and Diffusers.
 3. Wall Technology, Inc.; Customline Diffusers.

2.2 INTERACTIVE ACOUSTICAL PANEL SYSTEM

- A. Type AP-3: Absorber Panels: Manufacturer's standard fabrication of 6 lb./cu. ft. fiberglass board with foil backing (no exposed fiberglass), metal or hardened epoxy edged frames, covered with Class A rated fabric according to ASTM E 84. Support brackets are integrated into the metal edged frame or back of panel to receive mounting hardware.
- B. Diffuser Panels:
1. Type SATC-1 - Ceiling diffuser manufacturer's standard construction of thermo-molded plastic, 0.125-inch material thickness.
 2. Type AP-4: Wall diffuser manufacturer's standard construction of thermo-molded plastic, 0.125-inch material thickness.
 3. Type AP-5: Wall diffuser manufacturer's standard construction of thermo-molded plastic, 0.125-inch material thickness, with glass fiber board glued to concave rear surface of wall panels greater than or equal to 24 sq. ft.
 4. Provide panels with wall or ceiling mounting hardware as required.
- C. Mounting Hardware: Manufacturer's standard; furnish mounting clips and wall channel brackets for wall panels. Standard ceiling panels to be supplied with hooks for wire suspension, supports, supports for lay-in grid applications or for direct ceiling mounting.
- D. Finishes:
1. Wall-Mounted Panels: Manufacturer's standard woven plain weave 100 percent polyester 2-ply fabric wrapping entire core and frame and glued to back of frame; colors as selected from manufacturer's standard range.
 2. Ceiling-Mounted Panels: Manufacturer's standard white, "orange peel" texture.
 3. Ceiling-Mounted Absorber Panels: Manufacturer's standard woven plain weave 100 percent polyester 2-ply fabric wrapping entire core and frame and glued to back of frame; colors as selected from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of acoustical wall panels.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install interactive acoustical wall panels with vertical surfaces and edges plumb, top edges level, and in alignment with other panels, scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's printed instructions for installation of

panels using type of mounting accessories as recommended by manufacturer. Cut units to be at least 50 percent of unit width, with facing material extended over cut edge to match uncut edge. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.

B. Construction Tolerances: As follows:

1. Variation from Plumb and Level: Plus or minimum 1/8 inch.
2. Variation of Joints from Hairline: Not more than 1/8 inch.

3.3 CLEANING

- A. Clean panel facing upon completion of installation to remove dust and other foreign materials from the facing, using a dry brush, a vacuum, or both.
- B. Remove surplus materials, rubbish, and debris resulting from acoustical wall panel installation, upon completion of the Work, and leave areas of installation in a neat and clean condition.

3.4 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that acoustical wall panels are without damage or deterioration at the time of Substantial Completion. Replace panels that cannot be cleaned and repaired, in a manner acceptable to the Architect, prior to the time of Substantial Completion.

END OF SECTION

SECTION 09 54 50 - FRP CEILING SYSTEM**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Glass-fiber panel ceiling system; GFC on Drawings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers.

1.3 REFERENCE STANDARDS

- A. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- B. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- C. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. LEED Submittals: Provide documentation of Noise Reduction Coefficient (NRC) for all classroom ceilings and comply with Section 01 81 13.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied acoustical sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- C. Product Data: Provide data on each type of product indicated.
- D. Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 foot.
- E. Samples for Initial Selection: For each type of glass-fiber ceiling panel and suspension system indicated.
- F. Product Certificate: Signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- G. Maintenance Data: For finishes to include in maintenance manuals.
- H. Warranty: Special warranty specified in this Section

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide glass-fiber panel ceilings that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Provide glass-fiber panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Exposed surfaces meet or exceed USDA and FSIS requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver glass-fiber panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing glass-fiber panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle glass-fiber panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install glass-fiber panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

- A. Coordinate layout and installation of glass-fiber panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 PRODUCTS

2.1 GLASS-FIBER PANELS, GENERAL

- A. Glass-fiber Ceiling System Colors: As selected by Architect from manufacturer's standard range of colors.

2.2 GLASS-FIBER CEILING PANELS

- A. Products:
 - 1. Crane Composites; Glasbord with Surfseal.
 - 2. Approved equal.
- B. Lay-In Ceiling Panels:
 - 1. Size: 24 by 48 inches.
 - 2. Pattern: Embossed.
 - 3. Nominal Thickness: 0.12 inch.

2.3 GLASS-FIBER SUSPENSION SYSTEMS, GENERAL

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
- B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

2.4 GLASS-FIBER SUSPENSION SYSTEM FOR GLASS-FIBER PANEL CEILING

- A. Products:
 - 1. Crane Composites; Sanigrid II Fiberglass Ceiling Grid System.
- B. Suspension System: Main and cross runners formed from glass-fiber that is moisture resistant (does not support mold or mildew and will not rust or corrode).
 - 1. Wall Angles: 12-foot long length fastened directly to wall with nylon drive rivets.
 - 2. Hold-Down Clips: Provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
 - 3. Face Design: Flat, flush.
 - 4. Accessories: Provide connector clips, wall anchors, and other accessories as required for complete installation.

2.5 SEALANT

- A. Sealant: Refer to Section 07 90 00 and Section 01 81 13.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which glass-fiber panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of glass-fiber panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of glass-fiber panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans. Protection of In-Place Conditions:

3.3 INSTALLATION

- A. General: Install glass-fiber panel ceilings to comply with ASTM C 636, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of glass-fiber ceiling area and where necessary to conceal edges of glass-fiber panels.
1. Apply glass-fiber sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install glass-fiber panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned glass-fiber panels as follows:
 - a. Install panels with pattern running in one direction parallel to long axis of space.
 2. Install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

- A. Clean exposed surfaces of glass-fiber panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Resilient stair accessories.
- D. Installation accessories.

1.2 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Verification Samples: Submit two samples, 12 x 12 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Certification: Submit written certification by manufacturer declaring products do not contain asbestos.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For resilient flooring and base, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content resilient flooring and base: 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 resilient flooring, base, and adhesive, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.

- b. For resilient flooring and base: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.

1.4 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. 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.

1.5 EXTRA MATERIALS

- A. One percent of each color and type of flooring used, minimum of one box of each color and type.
- B. Materials to be from the same dye lot as those installed.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Emissions of Flooring and Base: FloorScore certified.
- B. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness, and:
 - 1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Size: 12 x 12 inch.
 - 4. Thickness: 0.125 inch.
 - 5. Pattern: Marbleized.
 - 6. Colors and Pattern: As selected by Architect from manufacturer's full range of colors for tile of class, wearing surface, thickness, size and pattern specified.
 - a. A maximum of 12 colors will be selected for tile; 75 percent standard colors, 15 percent premium colors, and 10 percent solid feature colors.
 - b. Patterns of full size units to be provided by Architect.
 - c. Patterns requiring cutting to be expected at locations of curved ceiling patterns; curved ceiling patterns/bulkheads indicated by reflected ceiling plans to matched with floor tile installation, whether indicated or not, to be confirmed by Architect.
 - 7. Standard VCT Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong; Standard Excelon Imperial Texture, Multicolor.
 - b. Azrock; Standard VCT.
- C. High-performance Vinyl Composition Tile (See Alternate):
 - 1. Minimum Requirements: Comply with ASTM F 1066, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Size: 12 x 12, 18 x 18 or 24 x 24 inches.
 - 4. Thickness: 0.10 inch.
 - 5. Pattern: Through pattern.

6. Colors and Pattern: As selected by Architect from manufacturer's full range of colors for tile of class, wearing surface, thickness, size and pattern specified.
 - a. A maximum of 8 colors will be selected for tile, from solid and chip design palettes.
 - b. Patterns of full size units to be provided by Architect.
 - c. Patterns requiring cutting to be expected at locations of curved ceiling patterns; curved ceiling patterns/bulkheads indicated by reflected ceiling plans to matched with floor tile installation, whether indicated or not, to be confirmed by Architect.
 - d. Floor Patterns:
 - 1) Provide 6-color pattern in Corridors, Dining, Lobby, and Vestibules.
 - 2) Provide 4-color pattern in Classrooms.
7. Performance Characteristics:
 - a. High-performance compressed composition tile containing 67 percent natural quartz particles and minimum 30 percent recycled content.
 - b. Indentation Resistance (ASTM F 970 modified): 2100 psi.
 - c. Wear Resistance: Light Industrial; EN649.
8. Provide at locations indicated by Alternate Bid descriptions within the Contract Documents.
9. High-performance VCT Products: Subject to compliance with requirements, provide one of the following:
 - a. Upofloor, Mosaic Collection; www.upofloor.com.
 - b. Procedo - Versa Quartz.

2.2 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
 1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 2. Height: 4 inch.
 3. Thickness: 0.125 inch thick.
 4. Finish: Satin.
 5. Length: Roll.
 6. Color: Color as selected from manufacturer's standards.
 7. Manufacturers:
 - a. Burke Flooring: www.burkemercer.com.
 - b. Roppe Corp: www.roppe.com.
 - c. Nora Systems, Inc.: www.nora.com.

2.3 ACCESSORIES

- A. Subfloor Filler: Latex-modified, portland cement based or blended hydraulic cement based formulation; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
 1. Comply with low-emitting requirements specified in Section 01 81 13.
- C. Moldings, Transition and Edge Strips: Metal.
- D. Sealer: Types recommended by flooring manufacturer.

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 sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.
- C. 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.
- D. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- E. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - 2. Alkalinity: pH range of 5-9.
- F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. 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.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints 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.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

- B. Lay out 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.
 - 1. Lay tiles in pattern indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Before installation of flooring, secure metal strips with stainless steel screws.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers. Maintain floor pattern.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.5 RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.
- C. Vinyl Composition Tiles (Standard and High Performance): Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - 1. Use commercially available product acceptable to manufacturer.
 - 2. Coordinate selection of floor polish with Owner's maintenance service; first application by Contractor.
 - 3. Vinyl floors to be given two coats of high water-emulsion polish; after each polish coat, buff floors to an even luster with an electric polishing machine; final polish coat application must be completed minimum 48 hours prior to Owner's occupancy.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
- C. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 09 65 10 - HYBRID RESILIENT FLOORING**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes**

1. Rolled sheet backed, fused seam hybrid flooring.
2. Recycled content.
3. Five Year Installation Warranty.
4. Life Time Non Pro Rated Manufacturer's Warranty.
5. Maintenance Equipment.

1.2 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics, sizes, patterns, colors available, and method of installation.
- B. Layout Drawings: Show layout of flooring installation, at 1/8" scale, indicating locations of seams and all trim: size and location of all fill strips, and location of trim at all exposed edges.
- C. Verification of product Recycled content Certification and product Certification to NSF 140-2007.
- D. LEED Submittals: Comply with Section 018113.
 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For resilient flooring and base, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 1) MR Credit 3: BPDO - Sourcing of Raw Materials
 - (a) For recycled content resilient flooring and base: 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.
 - 2) MR Credit 4: BPDO - Material Ingredients
 - (a) For resilient flooring, base, and adhesive, if available: Material Ingredient Report.
 - 3) EQ Credit 2: Low-Emitting Materials
 - (a) For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
 - (b) For resilient flooring and base: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- E. Samples: Submit for verification purposes, 9- x 9-inch samples of each flooring required. Samples shall be accompanied by manufacturer's technical specification for each flooring required using terminology characteristics as listed in this specification. Also include a complete representation in sample form of all available colorations.

- F. Maintenance Data: Submit manufacturer's printed maintenance recommendations for the care, cleaning, and maintenance of the hybrid resilient flooring, including detailed instructions pertaining to pile lifting and hot water extraction methods.
- G. Manufacturer's representative will schedule within thirty-days of installation on-site preventative maintenance demonstration at no cost to Owner. Preventative maintenance demonstration will be reflective of most suitable equipment, chemistry and frequency to preserve the long-term appearance retention; same equipment to be provided as Service Equipment required in Contract. Chemistry absent of optical brighteners and hydrogen peroxide.

1.3 QUALITY ASSURANCE

- A. Flooring Contractor's Qualifications: Firm with not less than 5 consecutive years of experience in installation of hybrid resilient flooring type, quantity and installation methods similar to work of this section.
- B. Manufacturer's Qualifications: Firm with not less than 5 consecutive years of production experience with hybrid resilient flooring similar to type specified in this section; whose published product literature clearly indicates general compliance of products with requirements of this section. Manufacturer must be ISO 14001 certified.
- C. Measurement Verification: Dimensions shown on drawings are approximate. It is the Flooring Contractor's responsibility to verify all dimensions and job site conditions; order sufficient yardage for hybrid resilient flooring as indicated and to fill overage requirements as specified. No substitutions shall be permitted to make up for any shortage of material in overage or hybrid resilient flooring to be installed.
- D. Flooring Contractor shall be totally responsible for the accuracy of his measurements of total yardage, individual floor yardage, and dye lot yardage requirements, extra yardage for pattern match, and roll length requirements; no additional compensation shall be allowed for shortage of materials.
- E. Dye Lots: All hybrid resilient surface of the same type in continuous areas shall be from the same dye lots. Hybrid resilient surface flooring that is piece dyed and limited to dye batch sizes must be approved by the owner. Transition from one dye lot to another shall be detailed on shop drawings and approved by owner.
- F. Owner reserves the right to test hybrid resilient flooring at their expense to verify that the delivered hybrid resilient flooring as specified. If it does not meet specifications, manufacturer will reimburse owner the testing expense and the material may be rejected.

1.4 DELIVERY, STORAGE & HANDLING

- A. Deliver materials in original mill protective wrapping with mill register numbers and tags attached. Maintain wrappers and protective covers in place until hybrid resilient surface is ready for installation. Store inside, in well-ventilated area, protected from weather, moisture and soiling.
 - 1. Cutting: Before roll is cut, it shall be inspected for defects, color variations, or shipping damage and be immediately replaced if any of these conditions exist at no additional cost to the Owner. Hybrid resilient surface material shall be rolled out to insure that rolls are from the same dye lot.
- B. Deliver all required overages and maintenance stock to owner's specified location prior to beginning installation.

1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain temperatures in space in accordance with hybrid resilient flooring or adhesive manufacturer's recommendations, but in no case less than 70 degrees F for 24 hours prior to, during and after installation. Subfloor temperature should be a minimum 70 degrees F for 24 hours prior to and after installation.
- B. Precondition: All of the hybrid resilient surface material shall be spread in a room on site 48 hours prior to actual installation with the room preconditioned at a minimum of 70 degrees F with humidity between 35% and 65%.
 - 1. Moisture:
 - a. A calcium chloride test should be performed on the concrete to detect the presence of moisture. Acceptable results require that moisture content does not exceed 8 lbs. per 1,000 square feet per 24 hours. One calcium chloride test should be performed for every 300 yards of hybrid resilient flooring.
 - b. Relative Humidity ASTM-F-2170 test method to also be performed. Acceptable moisture levels are 85% maximum relative humidity.
 - c. Alkalinity tests must also be performed. PH should register between 5 and 10.
 - d. All tests should be documented and results saved.

1.6 SEAMING REQUIREMENT

- A. General: In addition to the requirements and recommendations of the Manufacturer, the following criteria shall be adhered to:
 - 1. Seaming layout shall enable future replacement, especially in large open areas and traffic paths. Seaming shall run parallel to major traffic flow whenever possible, unless specifically indicated in writing by Owner or owner's representative.
 - 2. No cross seams shall be allowed in drops of 10 feet or less.
 - 3. Seams shall be inconspicuous to visual inspection. No seams shall occur perpendicular to doors or entries. Seams occurring at doors, parallel to doors, shall be centered directly under the closed door.
 - 4. No pieces less than 12 inches in width shall be used in the Work.
 - 5. All cutting of hybrid resilient flooring for telephone and electrical outlets shall be the responsibility of the installer.
 - 6. All seams must be chemically welded. Contact, neoprene or water based latex type sealers are not allowed.
 - 7. All seams must pass 10,000 Impact Test for moisture penetration at the seams. British Spill Test is not applicable.
 - 8. Hybrid resilient flooring backing and homogeneous sheet vinyl floorings must be chemically weldable to eliminate transition moldings.
 - 9. No high-flammable seam weld allowed. No water-based adhesive allowed.

1.7 EXTRA STOCK

- A. General: Furnish 5 percent additional yardage of each hybrid resilient flooring type required; extra yardage is over and above any overage provided by manufacturer. Normal manufacturing overage not to exceed 10 percent for under 1000 yards, not to exceed 5% for over 1000 yards. Deliver to the Owner uncut in clearly marked dust-proof packages prior to commencement of work; store where directed.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's Life Time Non Pro Rated Warranty in writing registered with manufacturer. The non-prorated life time warranty shall specifically warrant against:
1. Excessive Surface Wear: More than 15 percent loss of pile fiber weight
 2. Excessive Static Electricity: More than 3.0 UV per AATCC 134
 3. Resiliency Loss of the Backing: More than 10 percent loss of backing resiliency
 4. Delamination
 5. Edge ravel
 6. Tuft Bind warranty instead of edge ravel and zippering is not acceptable.
 7. Zippering
- B. Definition of Lifetime: Lifetime is defined as the period from which materials are installed until the date in which the owner removes them from service.
- C. Installer's Warranty: Five Year Installation Warranty is to be provided in writing by the dealer purchasing and installing hybrid resilient flooring. The Five Year Installation warranty is to be provided by dealer and the installation company to include products being installed and related materials (base) for a period of 5 years.
1. The first installation inspection will take place immediately after completion of the installation and again in six months. A written report is to be provided to the Owner indicating the condition of all seaming and confirming that installation instructions have been followed.
 2. After the first two initial installation inspections have taken place (the first year) with written reports to the Owner, yearly inspections will take place for the remaining 4 years of the installation warranty period with annual written report provided to the Owner. Report the condition of the flooring and if any repairs are needed.
 3. Provide certification and warranty that product is fully recyclable through manufacturer's or aligned partner's currently operational recycling program. Include information regarding the following:
 - a. The recycling process itself (i.e. separation of components, chopping, melting, pelletizing, etc.)
 - b. Portions of the product that will be recycled back into itself.
 - 1) Name/type of resulting product.
 - 2) End-use of resulting product.
 - 3) Total product recycled content based on total product weight whether resulting product is recyclable (fully or partially) or non-recyclable.
 - 4) Portions of the product that will be down-cycled.
 - (a) Name/type of resulting product.
 - (b) End-use of resulting product.
 - (c) Total product recycled content based on total product weight.
 - (d) Whether resulting product is recyclable (fully or partially) or non-recyclable.
 - 5) Portions of the product that will be land filled and/or incinerated. (NOTE: "Incineration" includes waste-to-energy conversion, extraction of embodied energy; using heat from incineration as a fuel source.)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Products:
- B. Mannington; Integra HP RE complying with this Section.
 - 1. Basis-of-Design: Style Precision.
- C. Tandus Centiva; Powerbond Backed product complying with this Section and aesthetic approximating Basis-of-Design, as accepted by Architect.
- D. Contractor Option: As determined through bidding, the Contractor may select to provide Kinetex by J+J Flooring Group; a hybrid resilient tile flooring.

2.2 NSF 140 CERTIFICATION

- A. Product must be certified at the Gold level to ANSI standard NSF 140. Product certification must be conducted by an independent, third party organization such as Scientific Certification Systems. Provide documentation.

2.3 MATERIAL

- A. Product Type: Resilient tufted textile-Antron fiber 6,6 soft surface hybrid resilient flooring with fused seams
- B. Hybrid resilient flooring must meet the following minimum requirements:
- C. Construction:
 - 1. Face Fiber: Invista Antron Legacy or Lumena Type 6,6 Four Hole, Hollow Filament Nylon, with Permanent Stain and Bleach Protection, Static Control, and Duratech Soil Resistant Treatment, and a Fiber Modification Ratio of < 1.5 , or equivalent.
 - 2. Primary Backing: 100 percent Synthetic
 - 3. Secondary Backing: Integra HP RE with Chemically Weldable Seams for Complete Moisture Barrier and Minimum 10 percent Post-Consumer Recycled Content by Total Product Weight
- D. Soil Retardant: DuraTech by Invista or equivalent.
- E. Stain Resistance: XGuard with 15 Year Limited Warranty Against Staining, or equivalent.
- F. Bleach Resistance: ColorSafe with 15 Year Limited Warranty Against Color Loss from Bleach Spills
- G. Width: Manufacturer's standard sheet/roll width.
- H. Fiber Modification Ratio: < 1.5 ; To estimate the Modification Ratio of a fiber shape, the size of the outer circle's circumference of the fiber is compared to the size of the inner circle's circumference. The smaller the number, the less likely the fiber shape will trap and hold soil and be subject to premature crushing and matting.
- I. Static Control: < 3.0 KV when tested under AATCC 134.
- J. Flammability:
 - 1. DOC-FF-1-70 Pill Test: Passes.
 - 2. Floor Radiant Panel: Meets NFPA Class 1 when tested per ASTM-E-648 glue down.
 - 3. NBS Smoke Chamber: Less than 450 Flaming Mode. Per ASTM-E-662.
- K. Colorfastness:
 - 1. Lightfastness - AATCC 16E-1982 - Dark color: Gray scale rating of 4 or better after 160 standard fading hours as compared to AATCC Gray Scale for evaluation change in color.

2. Ozone and Gas - AATCC 129-1981 - Rating 3 or better per color AATCC transference scale.

- L. Moisture Barrier: Passes Moisture Impact at 10,000 cycles.
- M. Passes British Spill Test.
- N. Indoor Air Quality: Manufacturer must demonstrate product is certified under the CRI Green Label Plus Program.
- O. NSF 140 Certification: SCS Sustainable Choice Platinum

2.4 CATIONIC STAIN RESISTANCE

- A. Stain resistant properties must be permanent and not removable by commercial cleanings or abrasive wear. Under GSA requirements product must score no less than 8.0 (10.0 is the best) on the AATCC Red 40 Stain Scale. Test sample must first be exposed to 100 revolutions on the Taber Abrader (1,000-gram weight per H-18 wheel) and then abraded area must be stain tested using AATCC test method 175. Topical stain resistant treatments will not be acceptable. Stain resistant properties must be inherent and warranted for 15 years.

2.5 BLEACH RESISTANT

- A. Will resist color loss from diluted bleach applications for a period of fifteen years from the date of original installation. Diluted bleach applications means spills or splashes of diluted bleach solutions (10% or less) of the type normally used for cleaning or disinfecting purposes.

2.6 ENVIRONMENTAL ATTRIBUTES

- A. Hybrid resilient flooring must be 100% recyclable.
- B. Hybrid resilient flooring must meet the NSF 140 standard SCS Sustainable Choice-Platinum/EPP, California Platinum.
- C. Recycled Content: Hybrid resilient material must contain a minimum of 10% post-consumer recycled content.
- D. Low Emitting Materials: Hybrid resilient flooring and adhesives, must meet the Low Emitting Materials standards as outlined in U.S. Green Building Council LEED criteria.
- E. Adhesives must meet VOC emissions standards per South Coast Air Quality Management District Rule #1168, and CRI's Green Label Plus.
- F. End of Life Reclamation: Flooring must have an existing methodology actively in place to achieve landfill diversion.

2.7 ACCESSORIES

- A. Adhesives: Waterproof, non-flammable adhesive recommended and approved by manufacturer in writing for compatibility with product backing; have no calculated VOC's, be non-flammable, and meet the criteria of the CRI Green Label Plus Certification Program, SCAQMD Rule 1168 and CHPS 1350. MSDS and samples required on product used. Adhesive must have a lifetime bond warranty from manufacturer, which ensures seams remain fused - not gapped, exposed, shrink.
- B. Miscellaneous Materials: As recommended and approved in writing by manufacturer and selected by installer to meet project circumstance and requirements.
- C. After each area installed, the installer is to protect the installation from soiling and damage by other trades by covering installed product with heavy reinforced paper - no plastic covering approved. Protective covering to be maintained by the Contractor against tears rips, etc. during

the course of the Project and the paper to be removed and the flooring vacuumed by the dealer for the final inspection.

- D. Protection Paper: Fortifiber Corporation "Seekure 892", or approved heavy, reinforced, non-staining kraft laminated paper.

2.8 CONTRACTOR OPTION

- A. Product: As determined through bidding, the Contractor may select to provide Kinetex by J+J Flooring Group; a hybrid resilient tile flooring.
- B. Kinetex flooring modules (tiles):
1. Product and Color: To be selected to aesthetic established by Basis-of-Design.
 2. Backing: Polyester Felt Cushion.
 3. Dye Method: Solution Dyed.
 4. Wear Layer: Universal Fibers Polyester.
 5. Total Weight (Nominal Average): 4.5 oz - 5.2 oz / square foot.
 6. Pattern Repeat: N/A
 7. Soil Release: Yes.
 8. Standard Size: 18- x 36-inches.
 9. Warranties: Lifetime Product Performance, Colorfastness to Light & Crocking, Stain Removal, Static Protection, Protection from Edge Ravel and Delamination Failure; Lifetime Dimensional Stability.
 10. Flooring Radiant Panel: Class 1.
 11. Smoke Density: Less than 450.0 flaming (ASTM E 662).
 12. Static Test: Less than 3.0kv (AATCC-134).
 13. Recycled content: Minimum of 55% recycled content.
 14. NSF/ANSI 140 Platinum Certified.
 15. Closed-loop recyclable.
- C. Adhesive: Pressure-sensitive adhesive designed for the installation of Kinetex textile composite flooring modules.

2.9 MAINTENANCE EQUIPMENT

- A. Flooring installer or Contractor to schedule an in house maintenance demonstration to be given by the manufacturer within 30 days after installation or first phase of project with Owner.
- B. Maintenance package, standard system is to be purchased as part of their purchase with the flooring. Maintenance Package standard system must be included and delivered to the Owner for maintenance in service.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make subfloor acceptable for installation if applicable.

3.2 INSPECTION

- A. General:
1. Do not start work until works of other trades are substantially completed.
 2. Inspect surfaces to receive flooring and verify that all such work is complete to the point where this installation may properly commence.
 3. In the event of discrepancy, notify Contractor.

4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 5. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.
- B. Materials: Unroll all goods to verify all goods uniformity, quality, color and texture against the approved samples prior to installation. Any discrepancy should be brought to the attention of the Contractor.

3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's instructions and recommendations for installation of this type of flooring by the glue down method.
- B. Prepare the subfloor to insure a successful installation.
- C. Flooring to be installed with pile lying in the same direction (monolithic). Cut evenly and accurately to fit neatly at walls, columns, and projections. Extend flooring under open-bottomed and raised-bottom obstructions, and under removable flanges of obstructions.
- D. Installed flooring shall be free from ripples, ravel, frays, puckers and raw exposed edges. All loop pile will demonstrate some fuzzy edges due to normal manufacturing conditions. It is the contractor's responsibility to trim all edges to eliminate fuzzy seams.
- E. Expansion Joints: Do not bridge building expansion joints with continuous hybrid resilient flooring, provide for movement.

3.4 CLEANING AND PROTECTION

- A. Remove and dispose of debris and unusable scraps.
- B. Vacuum flooring using two motor, top loading, upright commercial machine with brush-only element, utilizing a high filtration dust bag. Remove spots in accordance with manufacturer's guidelines and replace flooring where spots cannot be removed. Remove any protruding face yarn using sharp scissors. Be certain to trim any loose yarns or fibers at all seams.
- C. Following cleaning and vacuum, carefully protect the flooring from soiling and damage until final acceptance. Protection shall be accomplished by using approved protection paper. Edges shall be lapped 6 inches and secured with non-asphaltic tape. Covering shall be kept in repair and damaged portions replaced during the construction and move-in period.
- D. Maintenance Materials: Deliver usable scraps to Owner's designated storage space, properly packaged and identified. Usable scraps are defined to include roll ends of less than 9 feet in length and pieces of more than 2 feet wide. Dispose of smaller pieces as construction waste.

END OF SECTION

SECTION 09 65 66 - RESILIENT ATHLETIC FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes resilient athletic sheet flooring.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals: Comply with Section 018113.
1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For resilient flooring and base, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - b. MR Credit 3: BPDO - Sourcing of Raw Materials
 - 1) For recycled content resilient flooring and base: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - c. MR Credit 4: BPDO - Material Ingredients
 - 1) For resilient flooring, base, and adhesive, if available: Material Ingredient Report.
 - d. EQ Credit 2: Low-Emitting Materials
 - 1) For interior wet-applied adhesives, primers, and sealers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
 - 2) For resilient flooring and base: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- C. Shop Drawings: Show installation details and locations of the following:
1. Floor patterns.
 2. Layout, colors, widths, and dimensions of lines and markers.
 3. Locations of floor inserts for athletic equipment installed through flooring.
 4. Seam locations for sheet flooring.
- D. Samples for Initial Selection: For floor covering indicated.
- E. Samples for Verification: For each color of floor covering indicated, 6-inch square Samples of same thickness and material indicated for the Work.
- F. Maintenance Data: For floor coverings to include in maintenance manuals.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store materials to prevent deterioration. Store rolls upright.

1.4 PROJECT CONDITIONS

- A. Adhesively Applied Products:
1. Maintain temperatures within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:

- a. 48 hours before installation, unless longer period is recommended in writing by manufacturer.
 - b. During installation.
 - c. 48 hours after installation, unless longer period is recommended in writing by manufacturer.
 2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
 3. Close spaces to traffic during floor covering installation.
 4. Close spaces to traffic for 48 hours after floor covering installation, unless manufacturer recommends longer period in writing.
- B. Install floor coverings after other finishing operations, including painting, have been completed.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sheet Floor Coverings: Furnish full-width rolls of not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color, and pattern of floor covering installed.
 2. Tile Floor: 5 percent of the floor surface to receive this type.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Certifications:
1. Greenguard Certification.
 2. Certified by manufacturer as suitable for basketball play, supported by project references; ball rebound 95 percent or better.

2.2 RESILIENT ATHLETIC FLOORING

- A. Basis-of-Design: Mondo; Advance Vulcanized 8 mm.
- B. Other Available Manufacturers: Subject to compliance with this Section and review under Comparable Product procedures:
1. PLAE US.
 2. Connor Sport Court International, a Gerflor Company; Product Control XT.
- C. Description:
1. Prefabricated rubber athletic surfacing with an engineered shock absorption layer for athlete comfort, calendered and vulcanized with a particular closed cell structure, based on special isoprenic rubbers, mineral fillers, stabilizing agents and pigmentation, with a system of differential elasticity between top surface and base.
 2. Manufactured in three layers which are vulcanized together. The shore hardness of the top layer will be greater than that of the other layers; shore hardness of layers to be recommended by the Manufacturer and the limits specified.
 3. Product to be phthalate-free, halogen-free, heavy metal-free, formaldehyde-free, isocyanate-free and BPA-free.
 4. Thickness: 8 mm.
 5. Roll Size: Approximately 6'-1" x min. 42 feet.

6. Colors: To be selected from manufacturers full range.
- D. Special Fabrication: Custom logo to be factory precision water jet cut in manufacturer's facility.
- E. Performance Criteria:
 1. Elongation at Break, ASTM D412: Minimum 230 percent.
 2. Tensile Strength, ASTM D412: Minimum 240psi.
 3. Static Coefficient of Friction, ASTM D2047: 0.50 or better.
 4. Hardness (Shore A), ASTM D2240: 68 \pm 5 (wear layer); 45 \pm 5 (backing).
 5. Critical Radiant Flux, ASTM E648: 0.45W/cm² or better (Class 1).
 6. Optical Density of Smoke, ASTM E662: Maximum 450.
 7. Static Load Limit (tested at 250psi), ASTM F970: 0.009 in or better.
 8. Greenguard Certification Greenguard: Yes.

2.3 ACCESSORIES

- A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
 1. Adhesives shall have a VOC content of 60 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
- D. Logo, Game Lines and Markers: Inlaid to top layer of dual-layer flooring product.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity and Adhesion Testing: Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
 - a. PH level must be in range of 7 to 8.5 and accepted by manufacturer.
 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

- b. Perform tests so that each test area does not exceed 200 sq. ft. and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - c. Perform tests recommended in writing by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation, unless manufacturer recommends a longer period in writing.
 - 1. Do not install floor coverings until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOOR COVERING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings, unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on floor coverings. Use nonpermanent, nonstaining marking device.
- E. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and floor covering manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 SHEET FLOOR COVERING INSTALLATION

- A. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet floor coverings as indicated on shop drawings, in sequence necessary by floor markers and logo.
- C. Seams: Prepare and finish seams to produce surfaces flush with adjoining floor covering surfaces.
 - 1. Roll the seams with hand rollers and remove any excess adhesives that may come through the seam.
 - 2. Seal seams to prevent openings from forming between cut edges and to prevent penetration of dirt, liquids, and other substances into seams.
 - 3. Hold seams in place with suitable weights for a minimum 12 hours.

- D. Roll flooring in both directions with a sectional floor roller; check for air bubbles and continue rolling if needed.

3.5 CLEANING AND PROTECTING

- A. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
 - a. Do not wash floor coverings until after time period recommended in writing by manufacturer.
- B. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over floor coverings. Protect floor coverings with plywood or hardboard panels to prevent damage from storing or moving objects over floor coverings.

END OF SECTION

SECTION 09 66 23 - RESINOUS MATRIX TERRAZZO FLOORING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Epoxy matrix terrazzo floor and base.
- B. Divider strips.
- C. Crack isolation membrane.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.
- C. NTMA (GRAD) - Aggregate Gradation Standards; The National Terrazzo and Mosaic Association, Inc; current edition.
- D. NTMA (EPOXY) - Epoxy Terrazzo Specifications; The National Terrazzo and Mosaic Association, Inc; Current Edition located at www.ntma.com.
- E. NTMA (SPECS) - Terrazzo Specifications; The National Terrazzo and Mosaic Association, Inc.; current edition located at www.ntma.com.
- F. NTMA Technical Bulletin 111.
- G. ASTM F2170- 11 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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 involved.
- C. Shop Drawings: Indicate divider strip and control joint layout, and details of adjacent components.
- D. Samples: Submit two samples, minimum 8 x 8 inch in size illustrating color, chip size and variation, chip gradation, matrix color and typical divider strip.
 - 1. Final color selection to be determined during sample review process.
- E. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.
- F. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied flooring system (primer, sealer, resinous epoxy, isolation membrane): Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- G. Provide instructions to maintain floors in compliance with ADAAG minimum slip retardant requirements for accessible route.

1.4 QUALITY ASSURANCE

- A. Manufacturer Experience:

1. Submit proof of associate membership in NTMA.
 2. Furnish a list of at least five epoxy terrazzo projects using material being submitted for this project installed during the last five years of the same scope, complexity and at least 50 percent of the square footage.
- B. Qualification Data: For qualified installer.
1. Submit proof of Contractor membership in NTMA.
 2. Furnish a list of at least five epoxy terrazzo projects using material being submitted for this project installed during the last five years for the same scope, complexity and at least 50 percent of the square footage.
- C. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

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 100 square feet.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.
- D. Accepted mock-up to be quality reference standard for balance of Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in their original, undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.
- B. Storage temperatures should be between 50°F to 80°F (10.0°C to 26.6°C).
- C. Keep products away from fire or open flame.

1.7 FIELD CONDITIONS

- A. Prior to surface preparation, terrazzo contractor shall:
 1. Evaluate slab condition, including slab moisture content and extent of repairs required, if any.
 2. Maintain the ambient room and floor temperature at 60°F (15.5°C) or above for a period extending 72 hours before, during and after floor installation. Concrete to receive epoxy terrazzo shall have cured for at least 28 days and be free of all curing compounds. Test concrete substrate to determine acceptable moisture levels prior to installation. Testing should be conducted according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes). Proceed with installation only after substrates have a maximum relative humidity measurement reading less than 75%. If relative humidity measurement reading is greater than or equal to 75%, Moisture Vapor Treatment is required. Apply to terrazzo substrates according to manufacturers instructions.
- B. Prior to and during each day of installation, the terrazzo contractor shall verify that the dew point is at least 5°F (-15°C) less than the slab and air temperature.
- C. Acceptable Substrates:
 1. Level tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4" in 10 feet (6.4 mm in 3.1m). Any irregularity of the surface requiring patching and/or leveling shall be done using epoxy and sand fill.
 2. Concrete floor shall be prepared mechanically by shot blasting in accordance with ICRI Guideline No. 03732. Specifically, surface preparation results should achieve a CSP3-CSP5 profile.

3. Concrete floor shall receive a steel trowel finish.
4. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
5. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible to ACI recommendations.

1.8 WARRANTY

- A. Terrazzo materials and installation shall be warranted for a period of two years from date of substantial completion.
- B. Warranty shall include the repair and/or replacement of materials or workmanship found to be defective per NTMA standards.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Sherwin-Williams Company/General Polymers: www.generalpolymers.com.
- B. Sika Corporation[]: www.sikafloorusa.com.
- C. TEC Specialty; H.B. Fuller Construction Products Inc; Tuff-Lite Epoxy Terrazzo.
- D. Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com/#sle.
- E. Crossfield Products Corp., Dex-O-Tex Division; Product Spectrum.
- F. Master Terrazzo Technologies, LLC; Product Morricite.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors:
 1. Thickness: 3/8 inch, nominal.
 2. Aggregate Type: marble chips, granite chips, glass and plastic to match Architect's sample..
 3. Aggregate Size: No. 2.

2.3 PREQUALIFIED CONTRACTORS

- A. Contractor shall use one of the following pre-qualified subcontractors:
 1. David Allen Company; www.davidallen.com.
 2. Roman Mosaic.
 3. Boatman and Mangnani.

2.4 EPOXY MATRIX TERRAZZO FLOORING

- A. Floors: Epoxy matrix, 3/8 inch thick.

2.5 MATERIALS

- A. Epoxy Matrix Terrazzo Topping: Aggregate and matrix mix applied to substrate, leveled, and ground smooth; two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- B. Primer: Manufacturers recommended primer for substrate.
- C. Moisture Vapor Treatment: Contractor to include MVT for all slabs on-grade, light weight concrete and green concrete.
 1. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH.

- D. Flexible Reinforcing Membrane: for substrate crack preparation and reflective crack reduction.
 - 1. Reinforcement: fiberglass scrim.
- E. Aggregate: Type as indicated; sized in accordance with NTMA Aggregate Gradation Standards; color(s) as indicated, uniform in color.
- F. Finishing Grout: Epoxy, color to match terrazzo matrix.
- G. Wet-applied floor system (primer, sealer, resinous epoxy, isolation membrane): Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.6 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 joint between strips sealed with flexible joint filler.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.
- E. Cleaner: Neutralizing liquid type, pH of 7.
- F. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
 - 1. Compliant with ADAAG minimum slip requirements for accessible routes.
 - 2. Provide minimum 0.6 static slip coefficient; minimum 0.8 for ramps.
 - 3. Compliant with VOC limits of Section 01 61 16.
- G. Subfloor Filler: Epoxy type.
- H. Primer: Type recommended by manufacturer and compliant with Division 1 Sustainable Requirements..
- I. Moisture Mitigation: Type recommended by manufacturer and compliant with VOC limits of Division 1 Sustainable Requirements.
- J. Crack Isolation Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
 - 1. Reinforcement: Fiberglass scrim.

2.7 MIXES

- A. Color Plate Selection: Match Architect's sample.
- B. Proportion epoxy terrazzo topping in accordance with resin manufacturer's recommendations.
- C. Charge and mix marble chips and epoxy resins in strict accordance with manufacturer's instructions.

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 correct vapor barrier was installed under slab-on-grade.
- E. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing per ASTM 2170 for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Internal Relative Humidity: Maximum of 75 percent, tested according to ASTM F2170.
 - 2. Alkalinity: pH range of 5 to 9, tested according to ASTM F710.
 - 3. Test each concrete floor substrate, regardless of age and grade level, for moisture.
 - 4. Conduct test around perimeter of area or room, at columns, and where moisture may be evident.
 - 5. Prepare diagram of area or room showing location and results of each test.
- F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare concrete substrate to "open" surface pores by means of vacuum shot blasting.
 - 1. Blast concrete surface to a Concrete Surface Profile between CSP 3 and CSP 5 as defined by the International Concrete Repair Institute.
- B. Remove all contaminating or bond breaking substances, including but not limited to, dust, laitance, curing compounds, coatings, sealers, oil and grease; any oil or grease not removed by vacuum blasting must be chemically removed.
- C. Acid etching is not acceptable.
- D. Remove spalled or deteriorated concrete; repair damaged concrete with epoxy fill from terrazzo resin manufacturer - latex fills or self-leveling underlayments are not acceptable
- E. Divider Strips and Joint Details in accordance with NTMA Technical Bulletin 111:
 - 1. Install strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.
 - 2. Control/Construction Joints (saw cut, cold joint):
 - a. Preferred: Separate double L-type angles back to back with minimum 1/8" (3.2mm) width between. Fill joint and area between strips with semi-flexible joint filler.
 - 3. Expansion Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8" (3.2 mm) width between. Fill area between strips with semi-flexible joint filler.
- F. Cracks and Non-Expansion Joints:
 - 1. Hairline cracks to receive detail coat of epoxy primer with 3-inch fiberglass tape.
 - 2. Fill cracks greater than hairline but less than 1/16 inch wide after surface preparation with neat, epoxy matrix; place detail coat of matrix over crack and embed 6-inch fiberglass cloth.
 - 3. Lightly abrade or solvent wipe treated cracks prior to applying primer.
 - 4. Cracks Greater than 1/16 Inch:
 - a. Fill cracks greater than 1/16 inch with epoxy matrix.
 - b. Place 25-30 mil detail coat so that matrix extends at least 9 inches to 12 inches on each side of crack or joint.
 - c. After matrix has leveled, lay precut reflective cracking membrane into wet matrix; smooth cloth with a flat steel trowel, allowing cloth to be encapsulated but remain exposed on the surface of matrix.

- d. Lightly abrade or solvent wipe treated cracks prior to applying primer.
- G. Apply primer in accordance with manufacturer's instructions.
- H. Apply moisture mitigation coating in accordance with manufacturer's instructions on all slabs on grade and all lightweight concrete slabs.

3.3 INSTALLATION - CRACK ISOLATION MEMBRANE

- A. Apply a crack isolation membrane across entire area(s) to receive fluid-applied flooring at elevated slabs and wherever light weight concrete is used; crack isolation membrane composed of fiberglass mesh and epoxy matrix.
- B. Precut fiberglass mesh to fit area to be covered.
- C. Thoroughly mix epoxy matrix and apply according to manufacturer's instructions to achieve 25-30 mils.
- D. Allow membrane to level until no ridges are showing.
- E. Install second coat or membrane at 15 mils and lay precut fabric into membrane until encapsulated but leaving the pattern of the cloth exposed.
- F. Do not cover treated area(s) within 72 hours of installation; solvent wipe completely prior to installing primer and finish flooring.
- G. Apply primer in accordance with manufacturer's instructions.

3.4 INSTALLATION

- A. Install divider strips according to pattern approved on shop drawings.
- B. Install divider and control joint strips straight and level to locations indicated.
- C. In corridors, provide expansion divider strips, including base spaced not more than 30 feet on centers, preferably at column lines, as directed by the Architect.
- D. Include adequate anchorage of metal strips, spaced not more than 6 inches to anchor noted strips to subfloor.
- E. Install base and border divider and control joint strips to match floor pattern.
- F. Install terminating cap strip at top of base; attach securely to wall substrate.
- G. Place terrazzo mix over substrate to thickness indicated.

3.5 APPLICATION - TERRAZZO

- A. Place terrazzo mix over prepared substrate to 3/8 inch thick.
- B. Trowel to a dense flat surface to the top of divider strips.

3.6 CURING

- A. Close area to allow undisturbed curing.
- B. Allow epoxy terrazzo to cure for 24 hours.

3.7 FINISHING

- A. Finish terrazzo to NTMA requirements and to polish specified.
- B. Produce terrazzo finish surface to match approved mockup, with 70 to 75 percent chip exposed.
- C. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method.

1. Cleanse floor after rough grinding and fill voids with epoxy matrix.
 2. Allow grout to cure; grout may be left on terrazzo until other trades work is completed.
 3. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- D. Apply patch mix to match mortar over ground surface to fill honeycomb exposed during grinding.
- E. Remove patch coat by grinding, using a fine grit abrasive.
- F. Polishing: Grind with 120 grit or finer stones until all grout is removed from surface. Repeat rough grinding, grout coat and polishing if large terrazzo chip voids exist after initial polishing.
- G. Surface Finishing:
1. Cleanse floor after polishing and remove latency and particulate matter; use neutralizing cleaner and allow to dry.
 2. Continue polishing process with diamond grits 220.
 3. Inspect entire surface for consistent appearance, manifesting no abrasion scratches from previous grits.
- H. Hand grind vertical and curved surfaces similarly.
- 3.8 TOLERANCES
- A. Maximum Variation from Flat Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.
- 3.9 CLEANING
- A. Scrub and clean terrazzo surfaces with cleaner in accordance with manufacturer's instructions. Let dry.
- B. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.
- C. Seal and polish surfaces, in accordance with manufacturer's instructions.
1. Apply a minimum of 2 sealer coats.
- 3.10 PROTECTION
- A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.
- B. Do not permit construction traffic over finished terrazzo surfaces.

END OF SECTION

SECTION 09 67 00 - FLUID-APPLIED FLOORING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fluid applied resinous flooring and base (Type RES).
- B. Integral colored patterns.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available .
- C. Samples: Submit two samples, 12 x 12 inch in size illustrating color and pattern for each floor material for each color specified.
- D. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - 2. For interior wet-applied flooring system (primer, topcoat, resinous epoxy): Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer (applicator) who has specialized in installing resinous flooring similar in material, design, and extent to that indicated for this Project and who is acceptable to resinous flooring manufacturer.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to install resinous flooring systems specified.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats, through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Mockup:
 - 1. Construct a minimum 100 square foot mockup including resinous flooring and base of finished Work.
 - 2. Locate where directed by Architect.
 - 3. Incorporate accepted mockup as part of Work; accepted mockup to be quality reference standard for balance of Project.
- D. Floor System Thickness Verification:
 - 1. At the Owner's discretion and under his supervision, the Contractor shall take 1-inch random cores through the system into the substrate to verify proper system thickness.
 - 2. Remove and replace cored areas less than specified thickness or increase thickness in a manner that does not affect the performance or integrity of the system.
 - 3. Repair cored areas that comply with the recommended system thickness to match the surrounding surface elevation, prior to applying the seal coat(s).

4. Cores taken and patched will be noticeable; therefore, cores shall be taken from areas where aesthetics are less critical.

1.4 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.

1.5 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

1.6 WARRANTY

- A. The Contractor and the manufacturer shall furnish a standard guarantee of the seamless quartz flooring system for a period of three years after installation; the labor and material guarantee shall include loss of bond and wear-through to the concrete substrate from normal use.
- B. In case of a warranty claim, the Owner will notify the manufacturer and Contractor in writing within 30 days of the first appearance of problems covered under this warranty.
- C. The Owner will provide access to the area during normal working hours for warranty rework.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. BASF.
- B. Crossfield Products Corp: www.crossfieldproducts.com/#sle.
- C. Dex-O-Tex: www.dexotex.com.
- D. Durex Coverings, Inc.: www.durexcoverings.com.
- E. Sherwin-Williams Company: www.sherwin-williams.com/protective.
 1. Ceramic Carpet (stairs and landings)
 2. Decorative Mosaic.
- F. Sika Industrial Flooring; www.sikafloorusa.com.
- G. Stonhard Group : www.stonhard.com .

2.2 SYSTEM CHARACTERISTICS

- A. Colors: Custom color mix consisting of maximum of 4 colors as selected by Architect from manufacturer's full range. Up to a maximum of 6 separate mixes of 4 colors may be elected for this project.
- B. Wearing Surface: Manufacturer's standard orange-peel texture.
- C. Integral Cove Base: 4 inches high.
- D. Overall System Thickness: 1/4-inch minimum.

2.3 SYSTEM COMPONENTS

- A. Manufacturer's standard components that are compatible with each other and as follows:

- B. Wet-applied floor system (primer, topcoat, resinous epoxy): Comply with low-emitting requirements in Division 01 Section “Sustainable Design Requirements - LEED.”
- C. Body Coats:
 - 1. Resin: Epoxy.
 - 2. Application Method: Self-leveling slurry with broadcast aggregates.
 - 3. Aggregates: Colored quartz (ceramic-coated silica) at stairs and landings; vinyl chips at decorative mosaic flooring.
 - 4. Aggregates for Abrasive Resistance: White Aluminum Oxide at minimum 8 pounds per 4 gallon unit.
- D. Primer: Type recommended by manufacturer for substrate and body coats indicated.
- E. Topcoats: Chemical-resistant sealing or finish coats.
 - 1. Resin: Water-based polyurethane.
 - 2. Finish: Satin.

2.4 MATERIALS

- A. Resinous floor surfacing system consisting of primer; body coat(s) including resin, hardener, aggregates, and colorants, if any; and sealing or finish coat(s); provide Basis-of-Design or comparable products of documented equivalent performance.

2.5 ACCESSORIES

- A. Base Caps: Jolly by Schluter; stainless steel Type 304.
- B. Fillet Strips: Molded of flooring resin material or molded material compatible with flooring as approved by the flooring manufacturer.
- C. Subfloor Filler: Resinous product; type recommended by flooring material manufacturer.
- D. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
 - 1. Comply with low-emitting requirements specified in Section 01 81 13.
- E. Fiberglass Mesh: Alkali-resistant mesh as embedment to reinforce crack isolation membrane; product to be produced specifically for this purpose.
- F. Metal Edge Strips: 1.1 Schluter-SCHIENE by Schluter; stainless steel Type 304.
- G. Contrasting Visual Strips at Stair Treads: 1-inch wide compatible acrylic strip set in resinous flooring prior to top coat; sealed by top coat.

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 the following limits:
 - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.

2. Alkalinity: pH range of 5-9.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

B. Vacuum clean substrate.

C. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - CRACK ISOLATION MEMBRANE

A. Apply a crack isolation membrane across entire area(s) to receive fluid-applied flooring; crack isolation membrane composed of fiberglass mesh and epoxy matrix.

B. Precut fiberglass mesh to fit area to be covered.

C. Thoroughly mix epoxy matrix and apply according to manufacturer's instructions to achieve 25-30 mils.

D. Allow membrane to level until no ridges are showing.

E. Install second coat or membrane at 15 mils and lay precut fabric into membrane until encapsulated but leaving the pattern of the cloth exposed.

F. Do not cover treated area(s) within 72 hours of installation; solvent wipe completely prior to installing primer and finish flooring.

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.

D. Cove at vertical surfaces.

E. Contrasting Visual Strips at Stair Treads: 1-inch wide compatible acrylic strip set in resinous flooring prior to top coat; sealed by top coat.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until cured.

END OF SECTION

SECTION 09 67 10 - SELF-LEVELING POLYURETHANE FINISH SYSTEM**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Labor, products, equipment and services necessary for resinous flooring Work in accordance with the Contract Drawings covering the following components:
 - 1. Primer.
 - 2. Self-Leveling Mortar.
 - 3. Top Coat.
- B. Location: Where indicated as Type COCS on the finish schedule.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 03 39 00 - Concrete Curing.

1.3 REFERENCES

- A. ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- B. ASTM D2240, Standard Test Method for Rubber Property—Durometer Hardness.
- C. ASTM D2369, Standard Test Method for Volatile Content of Coatings.
- D. ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- E. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- F. For additional standards please refer to Product Data Sheets

1.4 SUBMITTALS

- A. Comply with Section 01 30 00 - Administrative Procedures.
- B. Product Data: Submit manufacturer's product data, including physical properties and colors available.
- C. Manufacturer's Safety Data Sheet for each product being used.
- D. Product Samples: Submit Architectural Standard samples representative of the final finish, as applied. The Standard shall be approved in writing by the Architect and shall be the final standard of acceptance of the finish.
- E. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - 2. For interior wet-applied flooring system (primer and component coatings): Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- F. Maintenance Instructions: Submit manufacturer's maintenance instructions.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications:

1. Pre-Qualification: Each bidder for this project shall be pre-qualified and approved in writing by the material manufacturer.
 2. Applicator Experience: Each bidder must have a minimum 5 years experience in the application of the type of system specified. Contractor shall submit a list of five projects of similar size, scope and complexity.
- B. Mock-Up:
1. Construct one 100 sq.ft. (10 sq.m.) mock-up of each type and color of resinous flooring in location acceptable to Architect/Engineer to demonstrate quality of finished system, complying with manufacturer's instructions.
 2. Arrange for Architect/Engineer's review and acceptance, obtain written acceptance before proceeding with Work.
 3. Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section. Mock-up shall be left in place for the duration of the work.
- C. Pre-application Meeting: Convene a pre-application meeting two (2) weeks before start of application of floor coating. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review surface preparation, priming, application, curing, protection, and coordination with other work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
1. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number, and date of manufacture.
 2. Material should be delivered to job site and checked for completeness and shipping damage prior to job start.
- B. Storage:
1. Store materials in accordance with manufacturer's written instructions.
 2. Keep containers sealed until ready for use. Material should be stored in a dry, enclosed, protected area from the elements.
 3. Do not subject material to excessive heat or freezing.
 4. Shelf life: Established based on manufacturer's written recommendation for each material being used.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.
- D. Condition materials for use accordingly to manufacturer's written instructions prior to application.
- E. Record material lot number and quantity delivered to jobsite/storage.

1.7 SITE CONDITIONS

- A. Do not install the Work of this Section outside of the following environmental ranges with Manufacturers' written acceptance:
1. Material Temperature: Precondition material for at least 24 hours between 65° to 75°F (18° to 24°C)
 2. Ambient Temperature: Minimum/Maximum 50°/85°F (10°/30°C)
 3. Substrate Temperature: Minimum/Maximum 50°/85°F (10°/30°C). Substrate temperature must be at least 5°F (3°C) above measured Dew Point.

4. Mixing and Application attempted at Material, Ambient and/or Substrate Temperature conditions less than 65°F (18°C) will result in a decrease in product workability and slower cure rates.
 5. Relative Ambient Humidity: Minimum ambient humidity 30%, maximum ambient humidity 75% (during application and curing)
 6. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
- B. Substrate moisture:
1. Moisture content of concrete substrate must be = 4% by mass as measured with a Tramex® CME/CMExpert type concrete moisture meter.
 2. Additionally, relative humidity tests may be conducted per ASTM F2170 and values must be = 85%.
 3. If moisture content of concrete substrate is > 4% by mass as measured with Tramex® CME/CMExpert type and/or if relative humidity tests per ASTM F2170 exceed values > 85%, consider moisture mitigation systems or moisture tolerant primer.
- C. Utilities, including electric, water, HVAC and permanent lighting to be supplied by General Contractor
- D. Maintain constant ambient room temperature of plus or minus 15°F (plus or minus 7°C) with a minimum temperature of 50°F (10°C) and maximum temperature of 85°F (30°C). Maintain constant ambient room temperature for 48 hours before, during and after installation, or until cured. Do not apply while ambient and temperatures are rising.
- E. Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and cure period of the floor.
- F. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.
- G. Insure adequate ventilation and air flow.

1.8 WARRANTY

- A. Manufacturer's warranty covering the resinous flooring against defects in materials for one year from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design: Sika Corporation, Industrial Flooring; www.sikafloorusa.com.
- B. Resinous flooring system: Sikafloor 22NA PurCem is a self-leveling, medium to heavy duty, solid color, three-component, water dispersed polyurethane-based/cement and aggregate screed. System to consist of the following components:
1. Primer: Substrate priming is normally not required under typical circumstances. Substrate porosity/condition determines if primer/scratch coat is required
 2. Self-Leveling Mortar: Sikafloor 22NA PurCem.
 3. Top Coat: Sikafloor 31NA PurCem applied at 15 mils.
- C. System Thickness: 1/4 inch.
- D. Other Available Manufacturers: Subject to compliance with this section and Comparable Product submission procedures:
1. BASF.
 2. Durex Coverings, Inc.

3. General Polymers, Division of Sherwin-Williams.
4. Stonhard Group.

2.2 MATERIALS

- A. Primer: Substrate priming is normally not required under typical circumstances. Substrate porosity/condition determines if primer/scratch coat is required
- B. Self-Leveling Mortar: Sikafloor-22NA PurCem is a self-levelling, medium to heavy duty, solid color, three-component, water dispersed polyurethane-based / cement and aggregate screed. It is designed to provide excellent resistance to abrasion, impact, chemical attack and other physical aggression. Sikafloor-22NA has the following properties:
 1. Softening Point: 266°F (130°C)
 2. Density (ASTM C905): 16.84 lb./US gal. (2.02 kg/L)
 3. Flow: Approx. 11.8 in (300 mm)
 4. Service Temperature: - 40°F (- 40°C) min. / 212°F (100°C) max.
 5. Compressive Strength (ASTM 579)
 - a. 24 hrs: 3,191 psi (22 MPa)
 - b. 7 days: 5,366 psi (37 MPa)
 - c. 28 days: 5,802 psi (40 MPa)
 6. Tensile Strength (ASTM C307): 1,045 psi (6.5 MPa)
 7. Flexural Strength (ASTM C580): 2,314 psi (14.7 MPa)
 8. Pull-off Strength (ASTM D4541): > 254 psi (> 1.75 MPa) (substrate failure)
 9. Thermal Compatibility (ASTM C884): Pass
 10. Shore D Hardness (ASTM D2240): 80 - 85
 11. Indentation (MIL -PRF -24613): ~ 0%
 12. Impact Resistance (ASTM D2794): 5.02 ft - lb (6.81 joules) at 1/8" (3 mm) of thickness.
 13. Abrasion Resistance (ASTM D4060): CS-17/1,000 cycles/2.2 lb (1,000 g)
 14. Coefficient of Friction (ASTM D1894-61T): Steel 0.3, Rubber 0.5.
 15. Coefficient of Thermal Expansion (ASTM D696): 0.89 x 10⁻⁵ in/in/°F
 16. Water Absorption (ASTM C413): 0.10%
 17. Flexural Modulus (ASTM C580): 629,025 psi (4,335.7 MPa)
 18. Resistance to Fungi Growth (ASTM G21): Rated 0 (no growth)
 19. Resistance to Mold Growth (ASTM D3273): Rated 10 (highest resistance)
 20. VOC's Components A+B+C: < 5 g/L
- C. Broadcast Aggregate: Quartz aggregate.
- D. Top Coat: Three-component, solvent-free, high-build, colored, matt finish. Coating based on the unique Sikafloor PurCem water dispersed polyurethane/cement and aggregate technology with the following properties:
 1. Water Absorption (ASTM C413): 0.10%
 2. Flexural Modulus (ASTM C580): 629,025 psi (4,335.7 MPa)
 3. Softening Point: 266°F (130°C)
 4. Density (ASTM C905): 11.68 lb/US gal. (1.40 kg/L)
 5. Tensile Strength (ASTM C307): 1,552 psi (10.7 MPa)
 6. Flexural Strength (ASTM C580): 3,582 psi (24.7 MPa)
 7. Pull-off Strength (ASTM D4541): > 254 psi (1.75 MPa) (substrate failure)
 8. Thermal Compatibility (ASTM C884): Pass
- E. Cove base: Polyurethane mortar cove based.

- F. Interior wet-applied flooring system (primer and component coatings): Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive flooring system. Notify Architect/General Contractor/Owner/Owner's representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply to substrate treatments for moisture, repair, or leveling not of the same Manufacturer.
- B. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds bond inhibiting impregnations, waxes and any other contaminants. All projections, rough spots, etc. should be dressed off to achieve a level surface prior to the application.
- C. Concrete substrate to have a minimum compressive strength of 3,500 psi (24 MPa) at 28 days and a minimum of 215 psi (1.5 MPa) in tension at time of application.
- D. Substrate moisture:
 - 1. Measure and confirm Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
 - 2. Confirm and record above values at least once every 3 hours during installation, or more frequently whenever conditions change (e.g. Ambient Temperature rise/fall, Relative Humidity increase/decrease, etc.).
- E. Ensure concrete substrate conforms to the minimum requirements of the flooring manufacturer.
- F. Flooring system shall not be applied to sand-cement setting beds. Sand-cement beds shall be removed to structural concrete substrate and re-leveled/sloped as necessary to achieve grade and/or adequate drainage.
- G. Flooring system shall not be applied to asphaltic or bitumen membranes, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.
- H. Application to glazed or vitrified brick and tile, structural wood, steel shall only be permitted with Manufacturer's written recommendation.

3.2 SURFACE PREPARATION

- A. Prepare surface to receive flooring systems in accordance with manufacturer's written instructions.
- B. Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants. Remove sealers, finishes, and paints. Remove unsound concrete by appropriate mechanical means.
- C. Concrete: Shall be cleaned and prepared to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means (CSP level as per ICRI guidelines and manufacturer's written recommendation).
- D. Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void Manufacturer's warranty.
- E. Control joints and cracks: Provide repair and treatment of control joints and surface cracks utilizing manufacturer's standard materials and installation details.

3.3 APPLICATION

- A. Mix and apply material with strict adherence to manufacturer's written installation procedures and coverage rates.
- B. Follow Manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.
- C. Do not apply while ambient and substrate temperatures are rising.
- D. Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform color, sheen and texture, all within limitations of materials and areas concerned.
- E. Match colors and textures of approved samples.
- F. Install cove base at height indicated with 1 inch radius in accordance with manufacturer's written instructions.

3.4 CLEAN UP

- A. Disposal of this product, solution and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.
- B. Empty containers should be taken to an approved waste handling site for recycling or disposal.

3.5 PROTECTION

- A. Freshly applied material should be protected from dampness, condensation and water for at least 72 hrs.
- B. Beware of air flow and changes in air flow. Introduction of dust, debris, and particles, etc. may result in surface imperfections and other defects.
- C. Follow manufacturer's written recommendation with respect to cure, wait time and return to service.

END OF SECTION

SECTION 09 84 00 - ACOUSTICAL PANELS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Cementitious wood fiber wall panels; Drawing Designation AP-2.
- B. Back-mounted, acoustical wall panels with wood fiber board core and graphic film; Drawing Designation AP-1.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, and orientation.
- D. Selection Samples: Manufacturer's color charts for coverings, indicating full range available .
- E. Verification Samples: Fabricated samples of each type of panel specified; 12 x 12 in, showing construction, edge details, and covering.
- F. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For acoustic panels, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For certified wood panels: 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. EQ Credit 2: Low-Emitting Materials
 - a. For composite wood panels: 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.

1.3 QUALITY ASSURANCE

- A. Warranty Period for Cementitious Wood Fiberboard Wall Panels: Lifetime.
- B. Forest Certification: Provide wood panels 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.
- B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.
- C. Protect panel edges from damage.
- D. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 Specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS - CEMENTITIOUS WOOD FIBERBOARD WALL PANELS

- A. Armstrong/Tectum, Inc.

2.2 CEMENTITIOUS WOOD FIBERBOARD WALL PANELS - AP-2

- A. Cementitious Wood Fiberboard Wall Panels: Manufacturer's standard panel construction consisting of a cementitious wood fiberboard attached directly to wall; to be field painted, and complying with the following requirements:
 - 1. Panel Thickness: 2 inches
 - 2. Finish: Natural for field painting; minimum 4 different colors.
 - 3. Panel Widths: As indicated.
 - 4. Edge Detail: Beveled.
 - 5. Panel Lengths: As indicated.
 - 6. Noise Reduction Coefficient: NRC of not less than 0.60.
 - 7. Binders: Composite wood product shall be produced with binders containing no urea-formaldehyde.

2.3 BACK-MOUNTED, ACOUSTICAL WALL PANELS WITH WOOD FIBER BOARD CORE AND GRAPHIC FILM - AP-1

- A. Available Products: Subject to compliance with requirements, provide the following or pre-bid approved substitute:
 - 1. 3M; DI-NOC Architectural Finishes.
- B. Panel Construction: Manufacturer's standard recycled wood fiber board core panel construction with 3M DI-NOC vinyl film laminated to front face and edges.
 - 1. Color: As selected by Architect from manufacturers' full range of solid colors.
- C. Graphic Vinyl Film: As selected by Architect from manufacturers' full line of DI-NOC Designs.
- D. Nominal Core Thickness and Overall System NRC: 3/4 inch and not less than NRC 0.80.
- E. Panel Width: As indicated on Drawings.
- F. Panel Height: Fabricated height as indicated on Drawings; mounting height as indicated on Drawings.
- G. Graphic Text: Provide graphic text passage on 3M film as directed by Architect. Text to fill panel size.
- H. Flammability: Class A assembly.
- I. Corner Detail: Square to form continuous profile to match edge detail.

2.4 FABRICATION

- A. Sound-Absorption Performance: Provide acoustical wall panels with minimum NRCs indicated, as determined by testing per ASTM C 423 for mounting type specified.
- B. Acoustical Wall Panels: Panel construction consisting of facing material adhered to edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.

2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.
- D. Back-Mounting Devices: Concealed on backside of panel, recommended to support weight of panel, with base-support bracket system where recommended by manufacturer for additional support of panels, and as follows:
1. AP-1 and AP-2: Metal "Z" Clips and "Z" bar: Two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to allow for panel removal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- B. Install panels to construction tolerances of plus or minus 1/16 in for the following:
1. Plumb and level.
 2. Flatness.

3.2 CLEANING

- A. Clean facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- B. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.3 PROTECTION

- A. Provide protection of installed acoustical panels until completion of the work.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 91 23 - INTERIOR PAINTING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Wood.
 - 6. Gypsum board.
 - 7. Wood fiber acoustical panels.
 - 8. Cotton or canvas insulation coverings.
 - 9. Exposed PVC piping.
- B. Project includes painted murals or graphics within event spaces; following application of specified interior paint system, apply graphics with specified top coat and the use of precision cut masking films manufactured especially for paint masking - similar to court graphics.

1.2 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

1.3 DEFINITIONS

- A. Gloss Ranges:
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 REFERENCE STANDARDS

- A. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape.
- B. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for each type of product submitted.
- C. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For paints and coatings, if applicable: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO - Material Ingredients

- a. For paints and coatings, if available: 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 v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- D. LEED Submittal: Provide documentation of VOC content in g/L for primers, paints and coatings applied within the building waterproofing envelope.
- E. Samples for Initial Selection: Submit each type of topcoat product indicated.
- F. Samples for Verification: Submit each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, minimum 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- G. Product List: Submit each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- H. Maintenance Materials: Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 2 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.7 MOCK-UP

- A. Benchmark Samples (Mock-ups): Provide benchmark finish sample (all coats) for each coating type and substrate.
 - 1. Architect will select several rooms or surfaces to represent surfaces and conditions, for application of each paint system type and substrate; colors will be provided for Benchmark Samples.
 - a. Wall Surfaces: Complete minimum 100 square feet.
 - b. Small Areas and Items: Apply systems to items designated by the Architect.
 - 2. Complete Benchmark Samples per the requirements of this Section.
 - a. Provide required sheen, color and texture for each surface.
 - b. Architect-accepted Benchmark Samples to establish level of quality for remainder of Work.
 - 3. Architect to provide final color approvals from Benchmark Samples and intermediate coat wall colors; refer to subsection 3.3 of this Section.
 - 4. Benchmark samples to be prepared by individuals performing the remaining Work for this Project.

1.8 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. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F and a maximum 90 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Benjamin Moore & Co.
- B. Behr Process Corporation.
- C. PPG Paints.
- D. Sherwin-Williams Company.
- E. McCormick Paints.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Interior wet-applied paints and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- C. Colors:
 - 1. As selected by Architect from manufacturer's full range.
 - 2. Different colors may be used in the same room.
 - 3. Colors of frames may be different than doors.
 - 4. Colors for ceilings and trim may be different from walls, and walls may be more than one color or striped.
 - 5. Dark tints may be used on metal frames that may require more coats than that indicated on paint schedule for proper coverage; apply as many coats as necessary for complete hide.

PART 3 EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

- A. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. Use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. Seal surfaces that might cause bleed through or staining of topcoat.
- D. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- E. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
- G. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- H. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- I. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- J. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

- K. Passivated Galvanized Steel: Clean with a water-based industrial strength cleaner, and/or “Brush Blast” in accordance with SSPC-SP7. After the surface has been prepared, apply recommended primer to a small area. Allow primer to cure for 7 days, and test adhesion using the “cross-hatch adhesion tape test” method in accordance with ASTM D 3359. If the adhesion of the primer is positive, proceed with a recommended coating system for galvanized metal.
- L. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- M. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- N. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 COLOR COORDINATION

- A. Tint intermediate coats for wall surfaces to match color sample selections.
- B. Architect will visit the Project within 7 days after notification, to review primed walls for final color coordination.
- C. Allow 3 week days in schedule for Architect to change final wall colors between intermediate coat and remaining coat(s).
- D. Allow time to order final paint colors; do not order final paint colors until obtaining final color approvals.

3.4 APPLICATION

- A. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Wall Surfaces: Receive final color approvals following Architect's review of Intermediate Coats, before proceeding.
 - 3. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 4. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 5. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- B. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - a. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Finish doors on tops, bottoms, and side edges the same as faces.
- C. Block Fillers:
 1. Apply two coats of block filler to concrete masonry block at a rate to ensure complete coverage with pores filled.
 2. Perform a squeegee operation on second coat to fill all crevices and produce a smooth surface; do not remove filler material from surface with the squeegee operation.
- D. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
 1. Wall Surfaces: Tint Prime Coat a lighter shade to facilitate identification; tint Prime Coat to match color of finish coat, but provide sufficient difference in shade to distinguish Prime Coat from Intermediate Coat used for final color selections.
 2. Other Surfaces: Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- G. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- H. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.

- e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.
 - d. Exposed wiremold and conduit in all finished spaces to match color of wall.
- I. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork.
 - b. Acoustical wall panels.
 - c. Metal toilet enclosures.
 - d. Metal lockers.
 - e. Elevator entrance doors and frames.
 - f. Elevator equipment.
 - g. Finished mechanical and electrical equipment.
 - h. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Items indicated to receive other finishes.
 - 7. Items indicated to remain unfinished.
 - 8. Floors, unless specifically so indicated.

9. Ceramic and other tiles.
10. Acoustical materials, unless specifically so indicated.

3.5 CLEANING AND PROTECTION

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

3.6 INTERIOR PAINT SCHEDULE

- A. Concrete and Masonry Other Than Concrete Masonry Units:
 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unpainted Surfaces): Ultra Spec Masonry Int/Ext Acrylic Sealer (608).
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Semi-Gloss N539.
 - b. Behr Process Corporation:
 - 1) Primer: Premium Plus Interior All-In-One Primer & Sealer, 75
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Paints:
 - 1) Primer (Unpainted Surfaces): Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
 - 2) First and Second Coats: Speedhide Zero Interior Flat Latex, 6-4510XI.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unpainted Surfaces): Loxon Concrete and Masonry Primer LX02 Series.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2650 Series.
 - e. McCormick Paints:
 - 1) Primer (Unpainted Surfaces): Acrylok Interior/Exterior 100% Acrylic Masonry Primer 06451.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series .
 - B. Concrete Masonry Units:
 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Block Filler (Unpainted Surfaces): Ultra Spec Hi-Build Masonry Block Filler (571).
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss N539.
 - b. Behr Process Corporation:
 - 1) Block Filler (Unfinished Surfaces): Behr Pro Block Filler Primer, 50
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370

- c. PPG Architectural Coatings; Glidden Professional:
 - 1) Block Filler (Unpainted Surfaces): Concrete Coatings Interior/Exterior Block Filler 3010.
 - 2) First and Second Coats: Ultra-Hide No VOC Semi-Gloss Paint 1415.
 - d. PPG Architectural Coatings; PPG Paints:
 - 1) Block Filler (Unpainted Surfaces): Speedhide Latex Block Filler 6-15XI.
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - e. Sherwin-Williams Company:
 - 1) Block Filler (Unpainted Surfaces): PrepRite Latex Block Filler B25W25.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex S/G, B31-2650 Series.
 - f. McCormick Paints:
 - 1) Block Filler (Unpainted Surfaces): McCormick Interior/Exterior Latex Block Filler 01015.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series.
- C. Gypsum Board:
- 1. Flat Sheen: Ceilings.
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unpainted Surfaces): Ultra Spec 500 Waterborne Zero VOC Primer Sealer N534.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Flat N536.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces) Interior Drywall Primer & Sealer, 73
 - 2) First and Second Coats: Behr Pro i300 Interior Flat Paint, 310
 - c. PPG Paints:
 - 1) Primer (Unpainted Surfaces): Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
 - 2) First and Second Coats: Speedhide Zero Interior Flat Latex 1, 6-4110XISeries.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unpainted Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Flat, B30-2650 Series.
 - e. McCormick Paints:
 - 1) Primer (Unpainted Surfaces): McCormick 1st Step Interior Vinyl Primer Sealer 06431.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Flat 08 Series.
 - 2. Low-Luster, Satin or Eggshell Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec 500 Waterborne Interior Primer Sealer N534.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Zero VOC Eggshell Enamel N538.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces) Interior Drywall Primer & Sealer, 73

- 2) First and Second Coats: Behr Pro i300 Interior Eggshell Paint, 330
 - c. PPG Paints:
 - 1) Primer (Unfinished Surfaces): Speedhide Zero Latex Quick Drying Primer/Sealer, 6-4900XI.
 - 2) First and Second Coats: Speedhide Zero Interior Eggshell Latex 6-4310XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2650 Series.
 - e. McCormick Paints:
 - 1) Primer (Unpainted Surfaces): McCormick 1st Step Interior Vinyl Primer Sealer 06431.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.
- D. Woodwork and Hardboard - Painted:
 - 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Undercoat (Unfinished Surfaces): Fresh Start 100% Acrylic Superior Primer 023.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Zero VOC Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unpainted Surfaces) Interior All-In-One Primer & Sealer, 75
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Architectural Coatings; PPG Paints:
 - 1) Undercoat (Unfinished Surfaces): 17-921 Seal Grip Interior/Exterior Acrylic Universal Primer
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Undercoat (Unfinished Surfaces): Multi-Purpose Waterbased Acrylic-Alkyd Primer B79-450.
 - 2) First and Second Coats: ProMar 200 Zero VOC Interior Latex S/G, B31-2600 Series; or Pro Industrial Acrylic Coating S/G B66-650 (Doors & Frames).
 - e. McCormick Paints:
 - 1) Undercoat (Unpainted Surfaces): McCormick 1st Step Interior Latex Enamel Undercoater and Primer Sealer 06441.
 - 2) First and Second Coats: McCormick Total Advantage Zero VOC Professional Coating Semi-Gloss 10 Series.
- E. Mechanical and Electrical Items: Use 3-coat system best suited to substrate, satin finish. Use heat resistant materials where required.
- F. Ferrous Metal:
 - 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec HP Acrylic Metal Primer HP04.

- 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unfinished Surfaces): Premium Plus Multi-Surface Primer, 436
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Paints:
 - 1) Primer (Unfinished Surfaces): Pitt Tech Plus 4020 PF
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): Pro-Cryl Universal Primer, B66-1310 Series.
 - 2) First and Second Coats: ProMar 200 Latex Gloss, B11-2200 Series; or Pro Industrial Acrylic Coating S/G, B66-650 (Doors & Frames).
 - e. McCormick Paints:
 - 1) Primer (Unfinished Surfaces): Corotech Acrylic Metal Primer V110.
 - 2) First and Second Coats: McCormick Interlok Interior/Exterior Acrylic Semi-Gloss Urethane DTM 45 Series or comparable product; VOC limit must be compliant to LEED.
- G. Zinc-Coated (Galvanized) Metal:
- 1. Semi-Gloss Sheen:
 - a. Benjamin Moore & Co.:
 - 1) Primer (Unfinished Surfaces): Ultra Spec HP Acrylic Metal Primer HP04.
 - 2) First and Second Coats: Ultra Spec 500 Waterborne Interior Semi-Gloss 539.
 - b. Behr Process Corporation:
 - 1) Primer (Unfinished Surfaces): Premium Plus Multi-Surface Primer, 436
 - 2) First and Second Coats: Behr Pro i300 Interior Semi-Gloss Paint, 370
 - c. PPG Paints:
 - 1) Primer (Unfinished Surfaces): Pitt Tech Plus 4020PF
 - 2) First and Second Coats: Speedhide Zero Interior Semi-Gloss Latex Enamel, 6-4510XI Series.
 - d. Sherwin-Williams Company:
 - 1) Primer (Unfinished Surfaces): ProCryl Universal Primer, B66-1310 Series.
 - 2) First and Second Coats: ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
 - e. McCormick Paints:
 - 1) Primer (Unfinished Surfaces): McCormick Underlok Interior/Exterior Acrylic Latex Multi Purpose Primer 06452.
 - 2) First and Second Coats: McCormick Interlok Interior/Exterior Acrylic Semi-Gloss Urethane DTM 45 Series or comparable product; VOC limit must be compliant to LEED.
- H. Overhead Exposed Construction (Deck, Joists, Steel): One coat flat dry fallout coating system to cover formulated for compatibility with all substrates by any paint manufacturer specified in this Section. Use 100 percent acrylic, flash-rust-resistance dryfall.
- 1. Benjamin Moore & Co.: Benjamin Moore Latex Dry Fall- Flat (395).
 - 2. Behr: Behr Pro Dryfall Paint Flat, 890
 - 3. PPG Paints: Speedhide Super Tech WB Interior 100% Acrylic Dry-Fog Latex 6-724XI, 6-725XI.
 - 4. Sherwin-Williams Company: Pro Industrial Waterborne Acrylic Dryfall Flat, B42W00181.

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5. McCormick Paints: Interior Waterborne Acrylic Dry Fall; VOC limit must be compliant to LEED.
- I. Wood Fiber Acoustical Panels (Eggshell): One coat.
 1. Benjamin Moore & Co.: Benjamin Moore Latex Dry Fall Eggshell (396).
 2. Behr: Behr Pro i300 Interior Eggshell Paint, 330
 3. PPG Architectural Coatings; PPG Paints: Speedhide Zero Interior Eggshell Latex Enamel, 6-4310XI Series.
 4. Sherwin-Williams Company: Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42W00082.
 5. McCormick Paints: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series .
 - J. Cotton or Canvas Insulation-Covering Substrates, Including Pipe and Duct Coverings:
 1. Benjamin Moore & Co.:
 - a. Primer: Ultra Spec 500 Interior Zero VOC Latex Primer N534.
 - b. First and Second Coats: Ultra Spec 500 Interior Zero VOC Latex Eggshell, N538.
 2. Behr Process Corporation:
 - a. Primer: Kilz 2 Interior/Exterior Water-Base Primer, 2000
 - b. First and Second Coats: Behr Pro i300 Interior Eggshell Paint, 330
 3. PPG Paints:
 - a. Primer: Speedhide Zero Int. Latex Quick Drying Primer/Sealer, 6-4900XI.
 - b. First and Second Coats: Speedhide Zero Interior Eggshell Latex Enamel, 6-4310XI Series.
 4. Sherwin-Williams Company:
 - a. Primer: Multi-Purpose Latex Primer B51-450
 - b. First and Second Coats: ProMar 200 Zero VOC Latex Eg-Shel, B202600 Series.
 5. McCormick Paints:
 - a. Top Coat: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.
 - K. Exposed PVC Piping:
 1. Benjamin Moore & Co.:
 - a. Bond Coat: STIX Waterborne Bonding Primer SXA-110; Insl-X.
 - b. First and Second Coats: Ultra Spec 500 Interior Zero VOC Latex Eggshell, 538.
 2. Behr Process Corporation:
 - a. Primer: Kilz Adhesion Interior/Exterior Water-Base Bonding Primer, 2111
 - b. First and Second Coats: Behr Pro i300 Interior Eggshell Paint, 330
 3. PPG Paints:
 - a. Bond Coat: SEAL GRIP 17-921 Interior/Exterior 100% Acrylic Universal Primer/Sealer.
 - b. First and Second Coats: Speedhide Zero Interior Eggshell Latex Enamel, 6-4310XI Series.
 4. Sherwin-Williams Company:
 - a. Bond Coat: Zero VOC Multi Purpose Primer B 51-450 Series.
 - b. First and Second Coats: ProMar 200 Zero VOC Latex Eg-Shel, B202600 Series.
 5. McCormick Paints:
 - a. Prime Coat: McCormick Underlok Interior/Exterior Acrylic Latex Multi Purpose Primer 06452.
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- b. Top Coat: McCormick Total Advantage Zero VOC Professional Coating Eggshell 09 Series.

END OF SECTION

SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
 - 1. Interior Substrates:
 - a. Dressed lumber (finish carpentry).
 - b. Exposed wood panel products.

1.2 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of product indicated
- D. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
 - 2. Label each Sample for location and application area.
- E. Product List: For each product indicated, include the following:
 - 1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- F. LEED Submittals: Comply with Section 018113.
 - 1. 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 v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - a. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Benjamin Moore & Co.
- B. Cabot.
- C. PPG Paints.
- D. Sherwin-Williams Company.
- E. Behr Process Corporation.

2.2 MATERIALS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- B. Stain Colors: Match Architect's samples.
- C. Interior wet-applied paints and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

2.3 WOOD FILLERS

- A. Wood Filler Paste: As recommended by finish manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
 - 3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION

- A. Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.
- B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
3. Countersink steel nails, if used, and fill with putty tinted to final color to eliminate rust leach stains.

C. Apply wood filler paste to open-grain woods, to produce smooth, glasslike finish.

3.3 APPLICATION

- A. Apply in accordance with manufacturer's instructions.
1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING

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

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim, architectural woodwork.
1. Water-Based Varnish over Stain System:
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - 1) Old Masters Water-Based Wood Stain; Old Masters.
 - 2) DFT 300 Deft Interior Water Based Wood Stain <250 gpl VOC; PPG Architectural Coatings, PPG Paints.
 - 3) Minwax Performance Series 250 V.O.C. Compliant WoodFinish Interior Penetrating Stain 7250 Series; Sherwin-Williams Company.
 - b. Intermediate Coat: Water-based varnish matching topcoat.
 - c. Topcoat: Varnish, water based, clear, satin.
 - 1) Benwood Stays Clear Acrylic Polyurethane Low Lustre 423; Benjamin Moore & Co.
 - 2) Old Masters Water-Based Polyurethane Satin; Old Masters.
 - 3) DFT159 Deft Polyurethane Interior Water Based Satin; PPG Architectural Coatings, PPG Paints.
 - 4) WoodClassics Waterborne Polyurethane Varnish - Gloss A68V91 (first coat)/Satin A68F90 (second coat); Sherwin-Williams Company.
 - d. Topcoat: Varnish, water based, clear, semi-gloss.

- 1) Old Masters Water-Based Polyurethane Semi-Gloss; Old Masters.
 - 2) DFT 158 Deft Polyurethane Interior Water Based Semi-Gloss; PPG Architectural Coatings, PPG Paints.
 - e. Topcoat: Varnish, water based, clear, gloss.
 - 1) Old Masters Water-Based Polyurethane Gloss; Old Masters.
 - 2) DFT 157 Deft Polyurethane Interior Water Based Gloss; PPG Architectural Coatings, PPG Paints.
2. Water-Based Varnish System:
 - a. Prime Coat: Water-based varnish matching topcoat.
 - b. Topcoat: Varnish, water based, clear, satin.
 - 1) Benwood Stays Clear Acrylic Polyurethane Low Lustre 423; Benjamin Moore & Co.
 - 2) Old Masters Water-Based Polyurethane Satin; Old Masters.
 - 3) DFT159 Deft Polyurethane Interior Water Based Satin; PPG Architectural Coatings, PPG Paints.
 - 4) WoodClassics Waterborne Polyurethane Varnish - Gloss A68V91 (first coat)/Satin A68F90 (second coat); Sherwin-Williams Company.
 - c. Topcoat: Varnish, water based, clear, semi-gloss.
 - 1) Old Masters Water-Based Polyurethane Semi-Gloss; Old Masters.
 - 2) DFT158 Deft Polyurethane Interior Water Based Semi-Gloss; PPG Architectural Coatings, PPG Paints.
 - d. Topcoat: Varnish, water based, clear, gloss.
 - 1) Old Masters Water-Based Polyurethane Gloss; Old Masters.
 - 2) DFT157 Deft Polyurethane Interior Water Based Gloss; PPG Architectural Coatings, PPG Paints.
- B. Wood Substrates: Traffic surfaces including [floors] [and] [stairs].
 1. Polyurethane Varnish over Stain System:
 - a. Stain Coat: Stain, semitransparent, for interior wood.
 - 1) Old Masters Penetrating Stain; Old Masters.
 - 2) DFT 257 Deft Interior OIL Based Wood Stain <275 VOC; PPG Architectural Coatings, PPG Paints.
 - b. First Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Second Intermediate Coat: Polyurethane varnish matching topcoat.
 - d. Topcoat: Varnish, interior, polyurethane, oil modified, gloss.
 - 1) Old Masters Oil-Based Polyurethane Gloss; Old Masters.
 - 2) DFT 257 Deft Polyurethane Interior Oil Based Semi-Gloss or DFT 127 Deft Polyurethane Interior Oil Based Gloss <275VOC; PPG Paints.
 - 3) Minwax Ultimate Floor Finish Matte Sheen; Sherwin-Williams Company.
 2. Polyurethane Varnish System:
 - a. Prime Coat: Polyurethane varnish matching topcoat.
 - b. Intermediate Coat: Polyurethane varnish matching topcoat.
 - c. Topcoat: Varnish, interior, polyurethane, oil modified, gloss.
 - 1) Old Masters Oil-Based Polyurethane Gloss; Old Masters.
 - 2) DFT 127 Deft Polyurethane Interior Oil Based Gloss <350 VOC; PPG Architectural Coatings, PPG Paints.
 - 3) Minwax Ultimate Floor Finish Matte Sheen; Sherwin-Williams Company.

END OF SECTION

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Interior Substrates:
 - a. Concrete masonry units (CMU).
 - b. Gypsum board.
 - 2. Exterior Substrates:
 - a. Exposed concrete designated for painted finish.
 - b. Concrete masonry units (CMU).
 - c. Exposed steel canopy structure and other rooftop structures.
 - d. Exposed angle lintels and hung plates.
 - 3. All substrates listed in the schedule at the end of this section may not be required for this project.

1.2 DEFINITIONS

- A. Gloss Ranges:
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of finish-coat product indicated.
- D. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 - 1. Submit Samples on rigid backing, minimum 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- F. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For paints and coatings, if applicable: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For paints and coatings, if applicable: 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 v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- G. LEED Submittals: For Credit EQ 4.2, manufacturers' product data for interior coatings, including printed statement VOC content; requirements of coating systems for high humidity areas differ from normal-conditioned spaces.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - a. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.5 MOCK-UP

- A. Benchmark Samples (Mock-ups): Provide benchmark finish sample (all coats) for each coating type and substrate.
 - 1. Architect will select several rooms or surfaces to represent surfaces and conditions, for application of each paint system type and substrate; colors will be provided for Benchmark Samples.
 - a. Wall Surfaces: Complete minimum 100 square feet.
 - b. Small Areas and Items: Apply systems to items designated by the Architect.
 - 2. Complete Benchmark Samples per the requirements of this Section.
 - a. Provide required sheen, color and texture for each surface.
 - b. Architect-accepted Benchmark Samples to establish level of quality for remainder of Work.
 - 3. Architect to provide final color approvals from Benchmark Samples and intermediate coat wall colors; refer to subsection 3.3 of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Benjamin Moore & Co.

- B. Tnemec Company, Inc.
- C. International Paint LLC.
- D. PPG Paints.
- E. Sherwin-Williams Company.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Masonry (CMU): 12 percent.
 - b. Gypsum Board: 12 percent.
 - c. Concrete: 12 percent.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
- D. CMU Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale.
 - 1. Clean using methods recommended in writing by coating manufacturer.
 - 2. Blast clean according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.3 COLOR COORDINATION

- A. Tint intermediate coats for wall surfaces to match color sample selections.
- B. Architect will visit the Project within 7 days after notification, to review primed walls for final color coordination.
- C. Allow 3 week days in schedule for Architect to change final wall colors between intermediate coat and remaining coat(s).
- D. Allow time to order final paint colors; do not order final paint colors until obtaining final color approvals.

3.4 APPLICATION

- A. Apply in accordance with manufacturer's instructions.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Wall Surfaces: Receive final color approvals following Architect's review of Intermediate Coats, before proceeding.
 - 3. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 4. If undercoats or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 5. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Apply high-performance coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - a. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 3. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 4. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- D. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- E. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
 - 1. Wall Surfaces: Tint Prime Coat a lighter shade to facilitate identification; tint Prime Coat to match color of finish coat, but provide sufficient difference in shade to distinguish Prime Coat from Intermediate Coat used for final color selections.
 - 2. Other Surfaces: Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- F. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- G. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- H. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- I. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

3.5 CLEANING

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

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Concrete Substrates, Vertical Surfaces:
 - 1. Pigmented Polyurethane over Epoxy System (Gloss):
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Polyamide Epoxy V400.
 - 2) Intermediate Coat: Corotech Polyamide Epoxy V400.
 - 3) Topcoat - Gloss: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - b. International Paint LLC:
 - 1) Prime Coat: Devran 203.
 - 2) Intermediate Coat: Devran 203.

- 3) Topcoat - Gloss: Devthane 379 Series.
 - c. PPG Paints:
 - 1) Prime Coat: Amerlock 2 VOC Epoxy Coating.
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy Coating.
 - 3) Topcoat - Gloss: Amershield VOC Acrylic Polyurethane
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Finish, B73-300 Series. B73-300
 - 2) Intermediate Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy Finish, B73-300 Series.
 - 3) Topcoat - Gloss: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 27 W.B. Typoxy.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Semi-Gloss: Series 1081 Endura-Shield.
 - 4) Topcoat - Gloss: Series 1080 Endura-Shield.
- B. CMU Substrates:
- 1. Pigmented Polyurethane over High-Build Epoxy System - Gloss:
 - a. Benjamin Moore & Company:
 - 1) Block Filler: Corotech Epoxy Block Filler V163.
 - 2) Intermediate Coat: Corotech Polyamide Epoxy V400.
 - 3) Topcoat: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - b. International Paint LLC:
 - 1) Prime Coat: Tru-Glaze-WB 4015.
 - 2) Intermediate Coat: Bar-Rust 231 Series.
 - 3) Topcoat - Gloss: Devthane 379 Series.
 - c. PPG Paints:
 - 1) Prime Coat: Amercoat 68HS VOC Zinc Rich Epoxy Primer.
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy Coating.
 - 3) Topcoat: Amershield VOC Acrylic Polyurethane.
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: Epoxy, S-W Cement Plex 875 Acrylic Block Filler.
 - 2) Intermediate Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy B73-300 Series.
 - 3) Topcoat - Gloss: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 1254 EpoxoBlock WB.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Semi-Gloss: Series 287 Enviro-Pox.
 - 4) Topcoat - Gloss: Series 297 Enviro-Glaze.
- C. Steel Substrates: Exposed structural steel, rooftop structures, angle lintels and hung plate substrates.
- 1. Pigmented Polyurethane over Zinc-Rich Primer System:
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Organic Zinc Rich Primer V170.
 - 2) Intermediate Coat: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - 3) Corotech Aliphatic Acrylic Urethane Coating Gloss V500.

- b. Devoe Coatings:
 - 1) Prime Coat: Cathacoat 302H.
 - 2) Intermediate Coat: Bar-Rust 231 Series.
 - 3) Topcoat - Gloss: Devthane 379.
 - c. International Paint LLC:
 - 1) Prime Coat: Cathacoat 302H.
 - 2) Intermediate Coat: Bar-Rust 231 Series.
 - 3) Topcoat - Gloss: Devthane 379 Series.
 - d. PPG Paints:
 - 1) Prime Coat: Amercoat 68HS VOC Zinc Rich Epoxy Primer.
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy Coating.
 - 3) Topcoat: Amershield VOC Acrylic Polyurethane.
 - e. Sherwin-Williams Company:
 - 1) Prime Coat: S-W Zinc Clad XI WB Inorganic Zinc-Rich Coating.
 - 2) Intermediate Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy B73-300 Series.
 - 3) Topcoat: S-W Acrolon Waterbased Acrolon 100 WB Urethane Gloss Enamel.
 - f. Tnemec Company, Inc.:
 - 1) Prime (Shop) Coat: Series 94H2O Hydro Zinc. Refer to applicable Division 05 Section.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Gloss: Gold Standard Fluoropolymer Series V1070.
- D. Galvanized-metal substrates should not be chromate passivated if primers are field applied. If galvanized metal is chromate passivated, consult manufacturers for appropriate surface preparation and primers.
- E. Galvanized-Metal Substrates:
- 1. Pigmented Polyurethane over Epoxy Primer System:
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Waterborne Bonding Primer V175.
 - 2) Intermediate Coat: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - 3) Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - b. International Paint LLC:
 - 1) Prime Coat: Devran 203.
 - 2) Intermediate Coat: Devthane 379 Series.
 - 3) Topcoat: Devthane 379 Series.
 - c. PPG Paints:
 - 1) Prime Coat: Amerlock 2 VOC.
 - 2) Intermediate Coat: Amerlock 2 VOC.
 - 3) Topcoat: Amershield VOC Acrylic Polyurethane.
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: Pro Cryl Universal Primer B66-1310 or, for high abrasion areas: DTM Wash Primer B71Y00001.
 - 2) Intermediate Coat: Pro Industrial Waterbased Catalyzed Epoxy B73-300 Series.
 - 3) Topcoat: S-W Acrolon Waterbased Acrolon 100 WB Urethane Gloss Enamel.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 27 W.B. Typoxy.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.

- 3) Topcoat - Gloss: 1080 Endura-Shield.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:

1. Epoxy-Modified Latex System:
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Super Spec Waterborne Latex Block Filler 160.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Semi-gloss: Super Spec HP Acrylic Epoxy Semi-Gloss Catalyzed P43.
 - b. Benjamin Moore & Company; Corotech Line:
 - 1) Prime Coat: Corotech Epoxy Block Filler V163.
 - 2) Intermediate Coat: Corotech Waterborne Amine Epoxy Coating V440.
 - 3) Topcoat - Semi-gloss: Corotech Waterborne Amine Epoxy Coating V440.
 - c. International Paint LLC:
 - 1) Prime Coat: Tru-Glaze WB 4015 (squeegee into bugholes).
 - 2) Intermediate Coat: Match topcoat.
 - 3) Topcoat - Semi-Gloss: Tru-Glaze WB 4426.
 - d. PPG Paints:
 - 1) Prime Coat: Pitt Glaze WB 16-90 Epoxy Block Filler.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Semi-gloss: Pitt Glaze WB 1 16-510 Series Water Based Pre-catalyzed Acrylic Epoxy.
 - e. Sherwin-Williams Company:
 - 1) Prime Coat: Cement Plex 875 WB Epoxy Block Filler (high moisture areas), or S-W Loxon Block Surfacers, LX01 Series.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Gloss: Pro Industrial Water Based Catalyzed Epoxy EG B 73-300Series.
 - f. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 1254 EpoxoBlock WB.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Semi-Gloss: Series 287 Enviro-Pox.

B. CMU Substrates:

1. Epoxy-Modified Latex System:
 - a. Benjamin Moore & Company:
 - 1) Super Spec Waterborne Latex Block Filler 160.
 - 2) Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
 - 3) Topcoat - Semi-gloss: Super Spec HP Acrylic Epoxy Semi-Gloss Catalyzed P43.
 - b. Benjamin Moore & Company; Corotech Line:
 - 1) Prime Coat: Corotech Epoxy Block Filler V163.
 - 2) Intermediate Coat: Corotech Waterborne Amine Epoxy Coating V440.
 - 3) Topcoat - Gloss: Corotech Waterborne Amine Epoxy Coating V440
 - c. International Paint LLC:
 - 1) Prime Coat: Tru-Glaze WB 4015.
 - 2) Intermediate Coat: Matching topcoat.
 - 3) Topcoat - Gloss: Tru-Glaze WB 4428.

- d. PPG Architectural Coatings, PPG Paints:
 - 1) Prime Coat: Pitt Glaze WB 16-90 Epoxy Block Filler.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Semi-gloss: Pitt Glaze WB 16-510 Series Pre-Catalyzed Acrylic Water Based Epoxy.
 - e. Sherwin-Williams Company:
 - 1) Prime Coat: Cement Plex 875 WB Epoxy Block Filler (high moisture areas), or S-W Loxon Block Surfacers, A24W200.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Gloss: Pro Ind. Water Based Catalyzed Epoxy Gloss B73-300 Series.
 - f. Tnemec Company:
 - 1) Prime Coat: Series 1254 EpoxoBlock WB.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Gloss: Series 297 Enviro-Glaze.
- C. Steel Substrates:
- 1. Epoxy-Modified Latex System: Low contact/low traffic areas such as, but not limited to structural steel, overhead decking, pipes, ducts, etc., as scheduled.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Acrylic Metal Primer V110.
 - 2) Intermediate Coat: Corotech Waterborne Amine Epoxy Coating V440.
 - 3) Topcoat: Corotech Waterborne Amine Epoxy Coating V440.
 - b. International Paint LLC:
 - 1) Prime Coat: Devran 203.
 - 2) Intermediate Coat: Tru-Glaze WB 4426.
 - 3) Topcoat: Tru-Glaze WB 4428.
 - c. PPG Paints:
 - 1) Prime Coat: Amerlock 2 VOC Epoxy
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy
 - 3) Topcoat - Gloss: Amerlock 2 VOC Epoxy
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: S-W Pro Cryl Universal Metal Primer B66-310 Series.
 - 2) Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
 - 3) Topcoat - Gloss: Pro Ind. S-W Water Based Catalyzed Epoxy Gloss B73-300 Series.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 27 W.B. Typoxy.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Gloss: Series 297 Enviro-Glaze.
 - 2. Pigmented Polyurethane over Zinc-Rich and Epoxy System: High contact/high traffic areas such as, but not limited to doors, railings, frames, pipes, etc.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Organic Zinc Rich Primer V170.
 - 2) Intermediate Coat: Corotech Polyamide Epoxy Primer V150.
 - 3) Topcoat - Gloss: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - b. International Paint LLC:
 - 1) Prime Coat: Catha-Coat 302H.
 - 2) Intermediate Coat: Bar-Rust 231 Series.

- 3) Topcoat - Gloss: Devthane379 Series.
 - c. PPG Paints:
 - 1) Prime Coat: Amercoat 68HS VOC Zinc Rich Epoxy Primer.
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy Coating.
 - 3) Topcoat: Amershield VOC Acrylic Polyurethane.
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: S-W Zinc Clad XI WB Inorganic Zinc-Rich Coating.
 - 2) Intermediate Coat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - 3) Topcoat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - e. Tnemec Company, Inc.:
 - 1) Prime (Shop) Coat: Series 94H2O Hydro-Zinc. Refer to applicable Division 05 Sections.
 - 2) Intermediate Coat: Series 287 Enviro-Pox.
 - 3) Topcoat - Gloss: Series 297 Enviro-Glaze.
- D. Galvanized-metal substrates should not be chromate passivated if primers are field applied. If galvanized metal is chromate passivated, consult manufacturers for appropriate primers.
- E. Galvanized-Metal Substrates:
- 1. Epoxy over Epoxy Primer System: Low contact/low traffic areas such as, but not limited to structural steel, overhead decking, pipes, ducts, etc., as scheduled.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Polyamide Epoxy Primer V150.
 - 2) Intermediate Coat: Epoxy, matching topcoat.
 - 3) Topcoat Gloss: Corotech Polyamide Epoxy V400.
 - b. PPG Paints:
 - 1) Prime Coat: Amerlock 2 VOC Epoxy
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy
 - 3) Topcoat - Gloss: Amerlock 2 VOC Epoxy
 - c. International Paint LLC:
 - 1) Prime Coat: Devran 203.
 - 2) Intermediate Coat: Devran 224V.
 - 3) Topcoat: Devran 224V.
 - d. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 27 W.B. Typoxy.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat Gloss: Series Series 297 Enviro-Glaze.
 - 2. Pigmented Polyurethane over Epoxy Primer System: High contact/high traffic areas such as, but not limited to doors, frames, railings, pipes, etc.
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Corotech Organic Zinc Rich Primer V170.
 - 2) Intermediate Coat: Corotech Polyamide Epoxy Primer V150.
 - 3) Topcoat Gloss: Corotech Aliphatic Acrylic Urethane Coating Gloss V500.
 - b. International Paint LLC:
 - 1) Prime Coat: Devran 203.
 - 2) Intermediate Coat: Devran 203.
 - 3) Topcoat - Gloss: Devthane379 Series.
 - c. PPG Architectural Coatings, PPG Paints:

- 1) Prime Coat: Amerlock 2 VOC Epoxy
 - 2) Intermediate Coat: Amerlock 2 VOC Epoxy
 - 3) Topcoat - Gloss: Amershield VOC Acrylic Polyurethane
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: DTM Wash Primer B71Y1.
 - 2) Intermediate Coat: S-W Acrolon Waterbased Acrolon 100 WB Urethane.
 - 3) Topcoat - Gloss: Acrolon Waterbased Acrolon 100 WB Urethane.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 27 W.B. Typoxy.
 - 2) Intermediate Coat: Series 27 W.B. Typoxy.
 - 3) Topcoat - Gloss: Series 297 Enviro-Glaze.
- F. Gypsum Board Substrates:
 - 1. Epoxy-Modified Latex System:
 - a. Benjamin Moore & Company:
 - 1) Prime Coat: Insl-X Aqua Lock Plus AQ-0400.
 - 2) Intermediate Coat: Pre-Catalyzed Waterborne Wall Epoxy Semi-Gloss V341.
 - 3) Topcoat Pre-Catalyzed Waterborne Wall Epoxy Semi-Gloss V341.
 - b. International Paint LLC:
 - 1) Prime Coat: Tru-Glaze WB 4030.
 - 2) Intermediate Coat: Match topcoat.
 - 3) Topcoat - Semi-Gloss: Tru-Glaze 4426.
 - c. PPG Paints:
 - 1) Prime Coat: SPEEDHIDE Zero 6-4900XI Interior Latex Sealer Quick-Drying.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Semi-Gloss: Pitt Glaze WB 16-510 Series Pre-catalyzed Water Based Acrylic Epoxy.
 - d. Sherwin-Williams Company:
 - 1) Prime Coat: Pro Mar 200 Zero VOC Interior Latex Primer.
 - 2) Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - 3) Topcoat - Gloss: Pro Ind. Water Based Catalyzed Epoxy B73-300 Series.
 - e. Tnemec Company, Inc.:
 - 1) Prime Coat: Series 151-1051 Elasto-Grip.
 - 2) Intermediate Coat: Series W.B. Typoxy.
 - 3) Topcoat - Semi-Gloss: Series 287 Tneme-Glaze.

END OF SECTION

SECTION 10 11 01 - 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; 2009.
- B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.
- C. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
 - 1. Include dimensions indicating location of boards in relation to other items in the room.
- D. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.
- E. Test Reports: Show conformance to specified surface burning characteristics requirements.
- F. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For boards having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 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 or containing no added formaldehyde resins.
- G. Maintenance Data: Include data on regular cleaning, stain removal .

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. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide life-of-the-building warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

- C. Provide ten year warranty for tackboards to include repair or replacement of tackboards that fail in materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Visual Display Boards:
 - 1. MooreCo, Inc: www.moorecoinc.com.
 - 2. Claridge Products and Equipment, Inc; Product LCS Markerboard Series 1 (Basis-of-Design): www.claridgeproducts.com/#sle.
 - 3. Marsh Industries, Inc. : www.marsh-ind.com.

2.2 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Metal Face Sheet Thickness: 0.024 inch (24 gage).
 - 2. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 - 3. Backing: Aluminum sheet, laminated to core.
 - 4. Frame: Extruded aluminum, with concealed fasteners.
 - 5. Frame Profile: As indicated on drawings
 - 6. Frame Finish: Anodized, natural.
 - 7. Accessories: Provide chalk tray and map rail.
 - a. Provide continuous chalk tray; match length of markerboard.
 - b. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
 - 8. Modular support system.
- B. Tackboards: Composition cork.
 - 1. Vinyl Plastic Cork:
 - a. Natural materials consisting of linseed oil, granulated cork, resin binders and dry pigments, mixed and calendered onto a natural jute backing.
 - b. Color shall extend throughout total thickness of material.
 - c. Able to self-heal from thumbtack and pin punctures.
 - d. Does not dry, crack, peel or crumble.
 - e. Washable finish.
 - 2. Cork Thickness: 1/8 inch.
 - 3. Color: Minimum of nine color selections available for Architect selection; Architect reserves the right to select several colors throughout the Project.
 - 4. Backing: Fiberboard, 3/8 inch thick, laminated to tack surface.
 - 5. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 - 6. Size: As indicated on drawings.
 - 7. Frame: Same type and finish as for markerboard.
 - a. Exception: Tackboards mounted on doors to be provided with solid wood frame coordinated with species of door.
 - 8. Frame Finish: Anodized, natural.
- C. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.
 - 1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.

2. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
3. Configuration: As indicated on drawings.
4. Units Too Large to Ship Assembled: Fully assembled in factory, then disassembled for shipping.

2.3 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
 1. Core for markerboards.
 2. No added urea formaldehyde.
- C. Fiber Board: ASTM C208, cellulosic fiber board.
 1. Core for tackboards.
 2. No added urea formaldehyde.
- D. Aluminum Sheet Backing: 0.015 inch thick.
- E. Adhesives: Type used by manufacturer.
 1. No added urea formaldehyde.

2.4 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 2 inch wide overall, full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
 1. Provide two map hooks for every 48 inches of map rail or fraction thereof.
- C. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board.
 1. Provide one standard flag holder at the front of each classroom.
- D. Chalk Tray: Aluminum, manufacturer's standard extruded profile one piece full length of chalkboard, molded ends; concealed fasteners, same finish as frame.
 1. Do not provide chalk tray at gymnasium location.
- E. Mounting Brackets: To be modular system of slotted aluminum standards permitting height adjustment and interchangeability of units.

2.5 MODULAR SUPPORT SYSTEM FOR VISUAL DISPLAY BOARDS

- A. Standards: 72-inch-long, extruded-aluminum slotted standards designed for supporting visual display boards on panel clips. Standards shall be punched at not less than 4 inches o.c.
 1. Finish: Clear anodic.
- B. Panel Clips: Extruded aluminum or steel with finish to match standards.
- C. Fabricate visual display boards with integral panel clips attached to core material.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- 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.
- C. Butt Joints: Install with tight hairline joints.
- D. All fixed boards to be sealed to walls per authority having jurisdiction.

3.3 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 11 25 - BULLETIN BOARDS AND DISPLAY CASES**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Non-illuminated bulletin boards; recessed.
 - 2. Illuminated display cases.
 - 3. Poster cases.
- B. Related Sections include the following:
 - 1. Division 6 Section "Interior Architectural Woodwork" for custom cabinets for display cases.
 - 2. Division 10 Section "Visual Display Surfaces" for tackboards.
 - 3. Division 26 Sections for wiring and other electrical work associated with illuminated display cases.

1.2 DEFINITIONS

- A. Bulletin Board and Poster Cases: Tackable surface enclosed in a glazed cabinet.
- B. Display Case: Glazed cabinet with adjustable shelves.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for bulletin boards and display cases.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Show location of tack assembly seams and joints.
 - 3. Include sections of typical trim members.
 - 4. Wiring Diagrams: Power, signal, and control wiring for illuminated units.
- C. Samples for Initial Selection: For units with factory-applied color finishes as follows:
 - 1. Actual sections of tack assembly.
 - 2. Fabric swatches of vinyl-fabric-faced tack assemblies.
- D. Maintenance Data: For tack assemblies to include in maintenance manuals.
- E. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For boards having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 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 or containing no added formaldehyde resins.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain each type of product through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of bulletin boards and display cases and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.1 MATERIALS

- A. Give preference to products having recycled content.
- B. Hardboard: AHA A135.4, tempered.
- C. Particleboard: ANSI A208.1, Grade 1-M-1.
- D. Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
- E. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
- F. Cork Sheet: MS MIL-C-15116-C, Type II.
- G. Vinyl Fabric: FS CCC-W-408, Type II, burlap weave; weighing not less than 13 oz./sq. yd.; with flame-spread index of 25 or less when tested according to ASTM E 84.
- H. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.
- I. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3, with exposed edges seamed before tempering, and 6 mm thick, unless otherwise indicated.
- J. 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.

2.2 TACK ASSEMBLIES

- A. Vinyl-Fabric-Faced Tack Assembly: 1/4-inch- thick, vinyl-fabric-faced cork sheet factory laminated to 1/4-inch- thick particleboard backing.

2.3 WALL-MOUNTED BULLETIN BOARD AND POSTER CASES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Nonilluminated, Wall-Mounted Bulletin Boards:
 - a. Claridge Products & Equipment, Inc.
 - b. Ghent Manufacturing Inc.
 - c. Marsh Industries, Inc.
 - d. Poblocki & Sons.
 - e. PolyVision Corporation.
- B. General: Factory-fabricated unit consisting of manufacturer's standard cabinet with tack assembly on back inside surface and glazed doors at front.
- C. Aluminum-Framed Cabinet: Extruded aluminum; with clear anodic finish.
- D. Glazed Hinged Doors: 3/16 inch thick, 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. Number of Doors: As indicated on Drawings.
- E. Tack Surface: Vinyl-fabric-faced tack assembly.
 - 1. Color: As selected by Architect.
- F. Width: As indicated on Drawings.
- G. Height: As indicated on Drawings.
- H. Depth: As indicated on Drawings.
- I. Mounting Height: As indicated on Drawings.
- J. Mounting: Recessed.

2.4 DISPLAY CASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AARCO Products, Inc.
 - 2. Claridge Products & Equipment, Inc.
 - 3. Ghent Manufacturing Inc.
 - 4. Poblocki & Sons.
 - 5. PolyVision Corporation.
- B. Recessed, Plywood-Framed Cabinet: Factory-fabricated cabinet, with top, bottom, and sides fabricated from hardwood veneer plywood; with tack assembly on back inside surface, glazed doors at front, and 2-by-2-inch extruded-aluminum angle trim on face to cover edge of recessed opening.
 - 1. Veneer Species: Birch with transparent finish stained to match educational casework plastic laminate.
 - 2. Aluminum Finish: Clear anodic.
- C. Glazed Sliding Doors: 3/16 inch thick 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. Number of Doors: As indicated on Drawings.
- D. Shelves: Minimum 3/16 inch thick tempered glass; supported on adjustable shelf standards and supports.
 1. Number of Shelves: 1 shelf for every 12 inches in height or portion thereof, unless indicated otherwise.
- E. Adjustable Shelf Standards and Supports: Manufacturer's standard.
- F. Tack Surface: Vinyl-fabric-faced tack assembly.
 1. Color: As selected by Architect.
- G. Illumination System: Concealed top-lighting system consisting of LED fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
- H. Width: As indicated on Drawings.
- I. Height: As indicated on Drawings.
- J. Depth: As indicated on Drawings.

2.5 FABRICATION

- A. Fabricate bulletin boards and display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil canning, 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.

2.6 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" 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: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- E. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

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 work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for bulletin boards and display cases.
- D. Examine walls and partitions for suitable framing depth where 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, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
 1. Mounting Height: As indicated on Drawings.
- B. Bulletin Boards and Poster Cases: Attach units to wall surface with manufacturer's standard concealed hardware; attach aluminum trim over edges of recess cabinets.
- C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches 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 o.c.
- D. Comply with requirements in Division 16 for connecting illuminated display cases.
 1. After installation is complete, install new fluorescent lamps.
- E. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 10 14 00 - SIGNAGE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Room and door signs.
- B. Alternate room and door signs.
- C. Plaque.
- D. Dimensional characters.
- E. Emergency response (ER) signage.
- F. Double Faced LED Signage.

1.2 DESIGN REQUIREMENTS - INTERIOR SIGNS

- A. Permanent Rooms and Spaces:
 - 1. Provide signs identifying each room at each door.
 - 2. Type Styles:
 - a. Must be upper case and sans serif.
 - b. Must have a width to height ratio of between 3:5 and 1:1.
 - c. Must have a stroke width to height ratio of between 1:5 and 1:10.
 - 3. Tactile and Braille Characters: Characters raised a minimum of 1/32 inch and accompanied by Grade 2 braille.
 - 4. Slot for removable room name capable of containing two lines of text.
 - 5. Character Height: Tactile characters must be between 5/8 inch and 2 inches in height.
 - 6. Pictograms (Symbols), if specified:
 - a. Minimum of a 6 inch high field or background; must be supplemented by upper case tactile descriptive verbiage and Grade 2 braille below pictogram.
 - b. No other graphic can invade the pictogram field.
 - c. Pictogram itself is not required to be tactile.
 - d. Provide pictogram and descriptive verbiage accompanied by Grade 2 braille at locations required.
 - 7. Finish and Contrast:
 - a. Matte (non-glare) characters and background; minimum contrast of 70 percent.
 - b. Light characters on dark background or dark characters on light background are acceptable.
 - 8. Mounting Conditions:
 - a. Mount 60 inches from finish floor to baseline of highest tactile letter on latch side of door.
 - b. Where no wall space is provided at the latch side of the door, place on nearest adjacent wall so that a person can approach to within 3 inches of signage without protrusions or swing of door.
- B. Direction and Informational:
 - 1. Type Styles:
 - a. May be upper and lower case and sans serif.
 - b. Shall have a width to height ratio of between 3:5 and 1:1.
 - c. Shall have a stroke width to height ratio of between 1:5 and 1:10.
 - 2. Tactile and Braille Characters: Not required for Type 2 signage.
 - 3. Character Height: Characters shall be sized on viewing distance.

4. Pictograms (Symbols), if specified:
 - a. No tactile requirement.
 - b. Provide pictogram at locations designated in Signage Schedule and Drawings.
 5. Finish and Contrast:
 - a. Matte (non-glare) characters and background; minimum contrast of 70 percent.
 - b. Light characters on dark background or dark characters on light background are acceptable.
 6. Mounting Conditions:
 - a. Mount 60 inches from finish floor to baseline of highest tactile letter on latch side of door.
 - b. Where no wall space is provided at the latch side of the door, place on nearest adjacent wall so that person can approach to within 3 inches of signage without protrusions or swing of door.
- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, sign types, lettering font, tactile designations, foreground and background colors, locations, overall dimensions of each sign and method of attachment.
- C. 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 the drawings, include the drawing room number on schedule along with the room number that will appear on the sign.
- D. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips of the manufacturers full range of colors.
- F. LEED Submittals: Comply with Section 018113.
 1. EQ Credit 2: Low-Emitting Materials
 2. For interior wet-applied adhesives: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.

1.4 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 in name groups.
- C. Store tape adhesive at normal room temperature.

PART 2 PRODUCTS

2.1 SIGNAGE FABRICATION

- A. Available Manufacturers:
 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 2. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.

3. Bayuk Graphic Systems, Inc., Parkesburg, Pennsylvania.
 4. Digital Color Graphics, Pittsburgh, Pennsylvania.
 5. Supersine Company.
- B. Fabrication Method:
1. Plaque assembly to be plastic laminate construction; plastic laminate to be impervious to most acids, alkalies, alcohol, solvents, abrasives and boiling water; plastic laminate to be non-static, fire-retardant, and self extinguishing.
 2. Approximately 0.080-inch thick non-glare matte acrylic face laminated to approximately 0.080-inch thick acrylic back plate with filler to create windows for inserts, if so indicated.
 3. Non-tactile graphics to be subsurface or second surface applied signs; surface-applied graphics are not acceptable.
 4. Painted surfaces will not be accepted.
 5. Polycarbonate (0.03 inch thick) window inserts, if applicable; painted subsurface to match sign.
 6. Tactile Methods:
 - a. Option 1: Tactile Copy Material (where designated): Individual plastic letters or characters of one solid color and chemically bonded by the use of a high strength solvent within a matched routed depression in sign face to create graphics which are raised a minimum of 1/32 inch from the face of sign; tactile characters 5/8 inch to 2 inches in height as required by Architect.
 - b. Option 2: Tactile Copy (where designated): Produced by blasting the laminate assembly removing the background material, and raising the characters and braille; the characters and braille are part of the original outer laminate color and do not require painting.
 7. Braille (if applicable): Grade 2 braille engraved into face of sign.
 8. Mechanically fasten plaque assembly to wall by use of a backplate, which will be secured to the outer assembly.
 9. Corners as indicated; sides can be beveled or flat.
 10. Colors to be selected by Architect, which include custom fabrications based on manufacturer's capabilities.

2.2 EDUCATIONAL SIGNAGE

- A. Basis of Design: Apco Arcadia 2000 Series.
- B. Size: 8-1/2"H x 12"L.
- C. Holder and End Caps: ARH11-215H Natural satin anodized aluminum.
- D. Insert:
 1. ClearLens 0.40" PETG non-glare ARI-11-215H-CL with Decorative Wood Vinyl laminated on ClearLens ARI-45-215H-DW; DWC4 Naturals Series finish to be selected from manufacturer's full range.
- E. Backer: Lumicor as selected from Naturals Series.
 1. Size: Refer to drawings.
- F. Mounting: Surface mounted on wall; mechanically-fastened.
- G. Accessories: Suction Cup Removal Tool (SCT).
- H. Locations: Provide 20 signs, locate as directed by Architect.

2.3 DIMENSIONAL CHARACTERS

- A. Available Manufacturers:
 - 1. A. R. K. Ramos.
 - 2. Gemini Incorporated.
 - 3. Matthews International Corporation; Bronze Division..
- B. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- C. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
 - 1. Character Material: Aluminum.
 - 2. Mounting:
 - a. Typical: Concealed stud; projected 1 inch from wall with aluminum tube spacers.
 - 3. Letter and Number Heights: Provide sizes indicated on Drawings.
 - 4. Font: Helvetica Medium.
 - 5. Color: Match Architect's sample.
 - 6. Finish:
 - a. Typical - Interior and Exterior: Powder coat.
 - 7. Mounting Types: Projected studs and bottom angle bracket mount; refer to Drawings for locations.
 - a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - b. Bottom Angle Bracket Mount: 90° angle bracket measuring 2" x 2" x 1/4" secured to bottom stud locations of letters. Tie-backs to be provided for exterior letters over 8". Letters to be mounted by word.

2.4 PLAQUES

- A. Available Plaque Manufacturers:
 - 1. A. R. K. Ramos.
 - 2. Gemini Incorporated.
 - 3. Matthews International Corporation; Bronze Division.
 - 4. Metal Arts; Div. of L&H Mfg. Co.
 - 5. Nelson-Harkins Industries.
 - 6. Mills Manufacturing Company..
 - 7. Southwell Company (The).
- B. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).
- C. Cast Plaque: Provide castings free of pits, scale, sand holes, and other defects, as follows:
 - 1. Plaque Material: Bronze.
 - 2. Background Texture: Manufacturer's standard pebble or leatherette texture.
 - 3. Border Style: Projected bevel.
 - 4. Mounting: Concealed studs, noncorroding for substrates encountered.
- D. Cast-Bronze Plaque Finishes: Exposed surfaces free of porosity, burrs, and rough spots; with returns finished with fine-grain air blast.

1. Raised Areas: Hand-tool and buff borders and raised copy to produce manufacturer's standard satin finish.
 2. Background Finish: Dark oxidized.
 3. Clear Protective Coating: Coat exposed surfaces of copper alloys with manufacturer's standard, clear organic coating specially designed for coating copper-alloy products.
- E. Plaque Schedule: Two plaques.
1. Plaque Size: 18 inches wide by 12 inches high.
 2. Text Style: As selected by Architect from manufacturer's standards.
 3. Location: As indicated.
 4. Plaque for State Funded School Construction Projects: Provide general text indicated on sketch attached at the end of this Section; exact text will be provided by the Owner.
 5. County Plaque Layout: Exact text will be provided by the Owner.

2.5 EMERGENCY RESPONSE (ER) SIGNAGE

- A. Exterior Locations: The Main Entrance will not receive a sign - but will be known as Exterior Door #1. Starting from the Main Entrance and going in a clockwise direction in plan, provide a sign above each door labeled 2, 3, 4, and so on.
1. Construct exterior ER signage as follows:
 - a. Aluminum Thickness: 0.080 inch.
 - b. Engineer grade white reflective background paint.
 - c. Black lettering of high performance vinyl.
 - d. Font: Helvetica 10 inches high (provide sample for approval).
 - e. Size: 15 inches W x minimum 12 inches H, with 1/2 inch radius rounded corners.
 - f. Sign width may vary due to number with at indicated font and height.
 - g. One drilled hole on each side of sign at mid-height of sign.
 - h. Sign mounted to brick veneer above door opening with drilled holes aligning with horizontal mortar joint.
 - i. Secure to masonry with lead anchor shield and coarse thread galvanized coated Phillips head type screw.
 - j. Mechanically fasten with vandal proof anchors.
- B. Interior Locations: Provide ER signage mounted on the top of the door frame, centered on the door, with the corresponding designation indicated on the exterior door sign. The interior door sign shall be 2 inches high by 3 inches wide of the same materials specified for the exterior ER signs.

2.6 DOUBLE FACED LED SIGNAGE

- A. Exterior Message Board: Indicated as "LED Signage" on Drawings.
1. Basis-of-Design Product: Subject to compliance with requirements, provide the following product, or comparable product by another manufacturer:
 - a. Galaxy 20 MM Monochrome 3500 Series.
 2. Display Board Type: Double-faced, monochrome LED display.
 3. Size: 2'-9" high by 8'-0" wide by 1'-0" deep.
 4. Lines/Characters per line: 4/22.
 5. Character Height: 6" to 25".
 6. LED Display Color: Amber.
 7. Accessories:
 - a. Venus 1500 control software.

- b. Communication Option: Wireless ethernet bridge radio, with all required accessories to provide full wireless operation and control.
- B. LEED Compliance: Sign must not exceed luminance of 200 cd/sq m (nits) during nighttime hours; 2000 cd/sq m (nits) during daytime hours.

2.7 ACCESSORIES

- A. Exposed Screws: Chrome plated; tamper-proof.
- B. Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions after surfaces are finished.
- B. Install neatly, with horizontal edges level, plumb and true, and in correct relation to adjoining Work.
- C. Locate signs where indicated:
 - 1. If no location is indicated obtain Owner's instructions.
- D. Protect from damage until Substantial Completion; repair or replace damage items.
- E. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
- F. Cast-Metal Plaque: Mount plaque using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
 - 1. Concealed Mounting: Mount plaque by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.3 CLEANING

- A. Wash surfaces following installation.

END OF SECTION

APPENDIX E
SCHOOL PLAQUE

School plaque for State funded school construction projects (12" X 18")

<p>STATE FUNDS FOR THE (select appropriate option) THIS SCHOOL BUILDING WERE PROVIDED THROUGH THE PUBLIC SCHOOL CONSTRUCTION PROGRAM (DATE) <u>BOARD OF PUBLIC WORKS</u> LARRY HOGAN, GOVERNOR PETER FRANCHOT, COMPTROLLER NANCY K. KOPP, TREASURER</p>
--

options to be selected and inserted:

- "... CONSTRUCTION OF ..."
- "... CONSTRUCTION OF AN ADDITION TO ..."
- "... RENOVATION OF ..."
- "... CONSTRUCTION OF AN ADDITION AND RENOVATIONS TO ..."

SECTION 10 21 13.19 - 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; 2015.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Product Data: Provide data on panel construction, hardware, and accessories.
- D. Samples: Submit two samples of partition panels, 12 x 12 inch in size illustrating panel finish, color, and sheen.
- E. LEED Submittals: Comply with Section 018113.
 - 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.
- F. Test Reports indicating compliance with NFPA 286.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Comtec, Hiny Hiders, or Santana products by Scranton Products .
- B. Bradley Corporation.
- C. Hadrian.

2.2 COMPONENTS

- A. Toilet Compartments: Solid molded high density polyethylene (HDPE) plastic panels, doors, and pilasters, floor-mounted unbraced.
 - 1. Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 2. Recycled Content: Products with recycled content is preferred.
 - 3. Color: To be selected by Architect from manufacturer's entire range.
- B. Door and Panel Dimensions:
 - 1. Thickness: 1 inch.
 - 2. Door Width: 24 inch.
 - 3. Door Width for Handicapped Use: 36 inch, out-swinging.
 - 4. Height: Manufacturer's standard not less than 55 inch.
 - 5. Thickness of Pilasters: 1 inch.

- C. Urinal Screens: Wall mounted with continuous panel brackets and pilaster anchored to floor.
 - 1. Thickness: 1 inch.
 - 2. Height: Minimum 48" high IBC compliant screens.

2.3 ACCESSORIES

- A. Pilaster Shoes: Formed chromed steel with polished finish, 3 in high, concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow anodized aluminum tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
- C. Pilaster Brackets: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.
- D. Wall Brackets: Continuous type, satin stainless steel or extruded aluminum.
- E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
 - 2. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.
- F. Hardware: Polished stainless steel:
 - 1. Continuous hinges self-closing; stainless steel.
 - 2. Door Latch: Slide type with exterior emergency access feature.
 - a. Accessible stall door to be equipped with a slide latch that does not require gripping or twisting and shall be slotted to permit emergency access
 - 3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
 - 4. Coat hook with rubber bumper; one per compartment, mounted on door.
 - 5. Provide door pull for outswinging doors.
 - a. Provide two door pulls (one each side) at accessible compartments to comply with ADA requirements.
- G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer doors and partitions.
- H. Provide wall stop at out-swinging doors where applicable.

2.4 FABRICATION

- A. Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions.
- B. Make provisions for setting and securing continuous head rail at top of each pilaster.
- C. Provide shoes at pilasters to conceal supports and leveling mechanism.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 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.

3.2 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.3 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.
- D. Adjust latching hardware for proper operation.

END OF SECTION

SECTION 10 21 23 - CUBICLES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Surface mounted overhead metal curtain track and guides.
- B. Curtains.

1.2 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for curtain fabric characteristics and track system, including carriers.
- C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.
- D. Samples: Submit 12 x 12 inch sample patch of curtain cloth with representative hem stitch detail, heading with reinforcement, and carrier attachment to curtain header.
- E. Samples: Submit 12 inch sample length of curtain track including typical splice and mounting.
- F. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept curtain materials on site and inspect for damage.
- B. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 Specifications.
- C. Store curtain materials on site and deliver to Owner for installation when requested.

1.5 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Provide two of each curtain size.
- C. Provide ten extra carriers.

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.
 - 3. Imperial Fastener Co., Inc: www.imperialfastener.com/#sle.
 - 4. Inpro: www.inprocorp.com/#sle.

2.2 TRACKS AND TRACK COMPONENTS

- A. Track: Extruded aluminum sections; one piece per cubicle track run; channel profile.

1. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
 2. Track End Stop: To fit track section.
 3. Track Bends: Minimum 18 inch radius; fabricated without deformation of track section or impeding movement of carriers.
 4. Finish on Exposed Surfaces: White enamel finish.
- B. Curtain Carriers: Nylon roller to accurately fit track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal; one carrier for each 6 inches of fabric width.
- C. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.3 CURTAINS

- A. All Curtain Materials:
1. Naturally flame resistant or flameproofed; capable of passing NFPA 701 test.
- B. Curtain: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.
- C. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, same color as curtain.
- D. Curtain Fabrication:
1. Manufacture curtains of one piece, sized 10 percent wider than track length. Terminate curtain 12 inches from floor.
 2. Include open mesh cloth at top minimum 20 inches of curtain for room air circulation.
 3. Curtain Heading: Triple thickness not less than 1 inch and not more than 1-1/2 inches wide, with metal grommet holes for carriers 6 inches on center, double fold bottom hem not less than 1 inch and not more than 1-1/2 inches wide with lead weights included. Lock stitch seams in two rows. Turn seam edges and lock stitch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.
- B. Verify that field measurements are as indicated.

3.2 INSTALLATION

- A. Install curtain track to be secure, rigid, and true to ceiling line.
- B. Install end cap and stop device.
- C. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 22 26 - ACCORDION FOLDING PARTITIONS**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Furnish and install all accordion folding partitions shown on the drawings and specified herein.

1.2 RELATED WORK

- A. Electrical work including but not limited to the following electrical work by Electrical Section:
 - 1. Provide 115/230 volt single-phase (or 208 volt, 3-phase A.C.) electrical service in conduit to the reversing magnetic starter.
 - 2. Provide 115/230 volt single-phase (or 208 volt, 3-phase A.C.) electrical service between the starter and the gear motor.
 - 3. Provide 4" x 4" electrical box for the key switch located within line-of-sight of the folding partition.
 - 4. Provide 3-conductor, 18-gauge stranded wire in conduit between the key switch and starter.
 - 5. Provide key switch for door operation (3 position switch, spring return to center from right or left).

1.3 QUALITY ASSURANCE

- A. Installation shall be accomplished by factory trained personnel.
- B. Sound rated partitions shall have the laboratory sound rating indicated, when tested in accordance with the requirements of ASTM E-90.

1.4 SUBMITTALS

- A. Indicate required stacking depth, pocket width (if applicable) and height of header above finished floor. Show installation details, layout and any optional electrical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver to job site in manufacturer's original, unopened package.

1.6 COORDINATION

- A. Coordinate the efforts of the various trades affected by the work of this section. Assure accurate installation of header, jamb and trim. Provide "As-Built" dimensions for opening and storage pocket.
- B. Supervise unloading and handling. Store boxes flat (no more than three high) in a dry area and protect from elements that may damage materials. Replace damaged materials at no additional cost to the owner.
- C. Permanent power shall be in place for final connection when partitions are erected. Assure access to and proper clearance for motor operators.

PART 2 - PRODUCTS**2.1 MANUFACTURER**

- A. Basis-of-Design: Won-Door Corporation; product DuraSound.

2.2 MATERIALS

- A. Operation: Shall be top supported and motor-operated.

- B. Construction: Shall consist of two parallel accordion-type walls of panels independently suspended with no pantographs or interconnections except at the lead-post.
- C. Panels shall be formed of cold rolled vinyl-clad 24-gauge V-grooved steel. Vinyl shall be permanently bonded by heat pressure lamination to the steel panel. Panels shall be connected by full height extruded vinyl hinges.
- D. Insulation: Interior surfaces of both walls shall be completely covered with a continuous blanket of 2 lb. density foil-backed fiberglass fastened in place with steel spring-clips.
- E. Suspension systems: Shall consist of two extruded aluminum tracks spaced 6" or 8" on center attached to the overhead structural support. Each panel shall be suspended by a steel hanger pin and a pair of nylon-tired ball bearing rollers. Each lead-post shall be suspended by an 4-wheel ball bearing trolley.
- F. Lead-posts: Shall be of 16-gauge cold rolled steel and shall be connected to the partition by specially formed steel panels. Lead-post hardware shall include standard grip-type handles and sliding latch to affect closure.
- G. Perimeter Seals: Shall consist of continuous extruded vinyl sweep strips attached to the top and bottom of the partition. Leading edges of lead-posts and receiver posts shall be acoustically sealed by extruded vinyl interlocking seals.
- H. Hanging weight shall be 4.2 pounds per square foot.
- I. Stabilizer Bar: Shall consist of a top supported, internally mounted diagonal brace connected to the lead-post for proper alignment during operation and latching.
- J. Motor Operator:
 - 1. Operation: Motor-operated folding partitions shall be driven by means of a roller chain attached to the stabilizer bar trolley. An internally mounted stabilizer bar shall keep lead posts plumb and in proper alignment during operation and insure a tight fitting closure without the use of mechanical latches.
 - 2. Assembly: Shall consist of a 115/230 volt single-phase A.C. motor or 208 volt 3-phase A.C. gear motor, reversing electromagnetic starter, and limit switch. Size of each motor shall be determined by manufacturer to insure proper operation.
- K. Key Locks: Key locks shall be provided by manufacturer.

2.3 ACOUSTICAL PERFORMANCE

- A. Sound transmission class (STC) shall be STC 48 when tested in accordance with requirements of ASTM E-90.

2.4 FINISH

- A. Vinyl finish color shall be selected by the architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Opening shall be to the dimensions specified, plumb and level.
- B. Headers shall be parallel with the finished floor to within $\pm 1/4"$ tolerance over the entire length of the opening.

3.2 INSPECTION

- A. Installer must inspect prepared opening and immediately notify the Architect, in writing, of unacceptable conditions.

3.3 INSTALLATION

- A. Install partitions in accordance with manufacturer's printed instructions.
- B. Upon completion of the installation, protect partitions from damage and replace or repair subsequent damage so that partitions are acceptable to the Architect, at no additional cost to the Owner.

END OF SECTION

SECTION 10 22 26.33 - FOLDING PANEL PARTITIONS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Acoustic operable panel partition.
- B. Ceiling track, ceiling guards, and operating hardware.

1.2 RELATED REQUIREMENTS

- A. Section 05 50 00 - Metal Fabrications: Overhead track structural support framing.
- B. Section 07 90 05 - Joint Sealers: Acoustical sealant.

1.3 REFERENCE STANDARDS

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- B. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- C. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions; 2012.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on partition materials, operation, and hardware and accessories.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, location and details of pass door and frame, and stacking depth.
- D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
- E. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Access panels.
 - 5. Plenum fire and acoustical barriers.
- F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.
- H. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials

- a. For recycled content in partitions: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of operable panel partition openings by field measurements before fabrication, if possible and within schedule constraints.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal wear.
 2. Warranty Period: Ten years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Advanced Equipment Corp.: www.advancedequipment.com.
- B. Modernfold, Inc; Product Acouti-Seal 931 (Basis-of-Design): www.modernfold.com.
- C. Panelfold, Inc: www.panelfold.com.
- D. Panel Operation: Manually operated, single panels.
 1. A series of manually operated individual flat steel panels.
 2. Final closure accomplished with a horizontally expanding panel.
 3. Welded hinge anchor plates within panel for additional support hinge mounting to frame.

4. Hinges must not anchor into panel edge or astragal.

2.2 MATERIALS

2.3 COMPONENTS

- A. Operable Panel Partition: Side opening; individual panels; center stacking; manually operated.
 1. Panel Finish: Vinyl coated fabric .
 - a. Color: As selected by Architect from manufacturers full range of fabrics and colors.
 2. Sound Transmission Class (STC): 47 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
- B. Panel Construction:
 1. Panel Substrate Facing: Steel sheet, minimum 21 gage.
 2. Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment.
 3. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
 4. Weld or lockform panel skins and weld panel skins directly to frames to form a unitized panel for non-racking rigidity and durability; panel skins which are adhesive laminated to frame, or skins not welded directly to steel frame are not permitted.
 5. Provide “wrap-around” skin/panel construction that does not require vertical trim on panel faces and shall, with astragal seal, provide a minimum “groove” appearance at the vertical panel joints. (Note: This is a required option when providing partitions manufactured by Advanced Equipment Corp.)
- C. Core: Minimum 18 gage formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
 1. Thickness with Finish: 3 inches.
 2. Factory applied surface finish.
 3. Trim: Trimless.
 4. Hinges: Full leaf butt hinges, attached directly to panel's steel frame, type, 18 gage stainless steel.
 5. Panel to Panel Seals: Grooved and gasketed astragals; continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
- D. Track: Formed steel; 1-1/4 x 1-1/4 inches size; thickness and profile designed to support loads, steel sub-channel and track connectors, track switches.
- E. Carriers: Ball bearing, steel wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.
- G. Accessories: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, .
 1. Provide, for each partition, one trimless markerboard (48 inches height by width of panel) and two trimless tackboards (48 inches height by width of panel); both sides of partition.
- H. Acoustic Sealant: Specified in Section 07 90 05.

2.4 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 - 1. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
 - 1. Multidirectional Carriers: Capable of negotiating 90-degree L, T, and X intersections without track switches.
- C. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
- D. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise 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.
- D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.2 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E 557.
- B. Fit and align partition assembly and pocket doors level and plumb.
- C. Lubricate moving components.
- D. Apply acoustic sealant to achieve required acoustic performance.

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.

3.5 CLOSEOUT ACTIVITIES

- A. Engage a factory-authorized service representative to demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 26 00 - DECORATIVE SEMI-RIGID WALL COVERING**PART 1 - GENERAL****1.1 SUMMARY**

- A. This section includes the following types of wall protection systems:
 - 1. Wall Covering

1.2 SUBMITTALS

- A. Product data and detailed specifications for each system component and installation accessory required, including installation methods for each type of substrate.
- B. Shop drawings showing locations, extent and installation details of wall covering products.
- C. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesive and primer: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
- D. Maintenance data for wall protection system components for inclusion in the operating and maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

- A. Installer qualifications: Engage an installer who has no less than 3 years experience in installation of systems similar in complexity to those required for this project.
- B. Manufacturer's qualifications: Not less than 5 years experience in the production of specified products and a record of successful in-service performance.
- C. Code compliance: Assemblies should conform to all applicable codes including IBC and Life Safety.
- D. Fire performance characteristics: Provide engineered PETG wall protection system components identical to those tested in accordance with ASTM E84 for Class A characteristics listed below:
 - 1. Flame spread: 25 or less
 - 2. Smoke developed: 450 or less
- E. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.
- F. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.
- G. Color match: Provide wall protection components that are computer controlled within manufacturing tolerances and typical limitations of digital printing color matching.
- H. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Interior surface protection products specified herein and installed on the submittal drawings shall be manufactured by Construction Specialties, Inc.

2.2 MATERIALS

- A. Engineered PETG: Rigid sheet should be high impact Acrovyn by Design with nominal .040" (1.02mm) thickness and supplied in 4' x 8' or 10' (1.22m x 2.44m or 3.05m) sheet sizes in standard Suede texture. High definition digital file reverse printed on clear sheet and sealed with protective backer. Custom artwork to be provided by Architect.
- B. Provide color-matched caulk and metal trims for joints/transitions.

2.3 FABRICATION

- A. General: Fabricate wall covering to comply with requirements indicated for design, dimensions, detail, finish and sizes.

2.4 ACCESSORIES

- A. Acrovyn Wall Covering shall be furnished as a complete packaged system, containing all adhesive. Adhesive shall be water based and non-hazardous. Water based primer is also available for purchase.
 - 1. Interior wet-applied adhesive and primer: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the work of this section in strict accordance with the manufacturer's recommendations using approved adhesive.

END OF SECTION

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Accessories for toilet rooms and utility rooms.
- B. Grab bars.

1.2 REFERENCE STANDARDS

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- C. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - 2. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.

1.4 COORDINATION

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS**2.1 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.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide 2 keys for each accessory to Owner; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- E. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Adhesive: Two component epoxy type, waterproof.

1. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.2 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.3 TOILET ROOM ACCESSORIES

- A. The design for each accessory is based on products indicated on the Drawings.

2.4 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. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
 2. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. JL Industries, Inc: www.jlindustries.com.
- B. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
- C. Potter-Roemer: www.potterroemer.com/#sle.

2.2 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Steel tank, with pressure gage.
 - 1. Class Multi-purpose 4-A:60-B:C.
 - 2. Size 10 pounds.
 - 3. Finish: Baked enamel, color as selected.

2.3 FIRE EXTINGUISHER CABINETS

- A. Description: Formed steel box with aluminum trim and door.
 - 1. Fire-Rated Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Cabinet Configuration: Recessed type.
 - 1. Sized to accommodate accessories.
 - 2. Trim: Returned to wall surface, with 1/4 to 5/16 inch projection, 1-3/4 inch wide face.
 - 3. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- C. Door: Reinforced for flatness and rigidity. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.

- D. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.
 - 1. Design: Vertical Duo.
- E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- F. Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Clear anodized.
- H. Finish of Cabinet Interior: White enamel.

2.4 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10 50 00 - LOCKERS**PART - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Student lockers.
 - 2. Staff lockers.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work. Show locker fillers, trim, base, and accessories.
 - 1. Include locker-numbering sequence.
 - 2. Locker combinations must be cross referenced with locker numbers; individual lockers must have a minimum of five series of combinations that can be changed by the Owner as necessary. The cross reference information must be submitted in electronic format for the Owner's use.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.
- E. LEED Submittals: Comply with Section 018113.
 - 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.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.
- B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.

PART - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1. Republic Storage Systems Co., Inc.
 - 2. Basis-of-Design: Art Metal Products; Bulldog Corridor Lockers.
 - 3. List Industries, Inc.
 - 4. Lyon Metal Products, Inc.

5. Penco Products, Inc.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.
- C. Recycled Content: Provide steel with minimum 25 percent post-consumer recycled content.

2.3 LOCKERS

- A. Sizes: Refer to Locker Schedule on Drawings.
- B. Body: Form backs, tops, bottoms, sides, and intermediate partitions from steel sheet; flanged for double thickness at back vertical corners. Comply with the following:
 - 1. Back and Side Material Sheet Thickness: 24 gage.
 - 2. Top and Bottom Material Sheet Thickness: 20 gage.
 - 3. Exposed Ends: Form exposed ends of nonrecessed lockers from minimum 16 gage thick steel sheet.
- C. Frames: Form channel frames from minimum 16 gage thick steel sheet; lapped and welded at corners. Form continuous integral door strike on vertical frame members. Provide resilient bumpers to cushion door closing.
 - 1. Cross Frames: Form intermediate channel cross frames between tiers from minimum 16 gage thick steel sheet. Weld to vertical frame members.
 - 2. Latching shall be achieved by securing an 11 gage frame hook to the locker side frame located midway up on the door.
- D. Doors:
 - 1. One-piece steel sheet, formed into double return flanges at vertical edges and flanged at right angles at top and bottom edges. Fabricate to prevent springing when opening or closing, and to swing 180 degrees.
 - 2. Comply with the following:
 - a. Sheet Thickness: 14 gage minimum.
 - b. Doors on tiered lockers shall be reinforced with a full height 16 gauge channel reinforcement.
 - c. Concealed Vents: Provide slotted perforations in top and bottom horizontal return flanges of doors. Doors shall be flush design without louvers or perforations.
- E. Shelves: Provide hat shelf in single-tier units; fabricated from minimum 24 gage thick, formed steel sheet; flanged on all edges.
- F. Hinges: Steel, full loop, five or seven knuckle; tight pin; minimum 2 inches high. Weld to inside of door frame and attach to door with at least two factory-installed fasteners that are completely concealed and tamper resistant when door is closed. Provide at least three hinges for each door more than 36 inches high and at least two hinges for each door 36 inches high or less.
- G. Recessed Handle and Latch: Manufacturer's standard housing, formed from 20 gage stainless steel, with integral door pull, recessed for locking devices as follows:
 - 1. At Staff Lockers: Provide single-point II safety latch system with built-in dead bolt combination lock.
 - 2. At Student Lockers: Frame hook shall have a padlock hasp protruding through the stainless steel recessed pocket. Padlocks to be supplied by Owner.

3. Doors shall have a catch to retain unlocked doors in the closed position and are to be self latching upon closing.

2.4 LOCKER ACCESSORIES

- A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:
 1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks. Attach hooks with at least two fasteners.
- B. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence as directed by the Owner. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- C. Continuously Sloping Tops: Manufacturer's standard, fabricated from minimum 16 gage thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers.
- D. Filler Panels: Manufacturer's standard; fabricated from minimum 18 gage thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.
 1. Lockers to be placed in center of available space for locker run with filler panels, of equal widths, at both ends of each locker run when required; a single filler panel at end of each locker run will not be accepted.
- E. Boxed End Panels: Manufacturer's standard; fabricated from minimum 16 gage thick steel sheet, with 1-inch-wide edge dimension, finished to match lockers, and designed for concealing exposed ends of nonrecessed lockers.

2.5 FABRICATION

- A. Knock-Down Construction: Fabricate lockers for nominal assembly at Project site.
- B. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.

2.6 ADA COMPLIANT LOCKERS

- A. Provide one handicapped accessible locker for every 50 lockers installed, complying with the following:
 1. Forward Reach Requirement: Provide single tier lockers with a hat/hook shelf and coat hooks located not more than 48 inches above finished floor. Provide one additional shelf near the bottom of the locker so that it is not lower than 15 inches above finished floor.
 2. Place ADA compliant lockers at least 24 inches away from any wall or other obstacle and provide a minimum clear floor space of 30 by 48 inches with 10-inch minimum for door swing. Provide an area in front of locker within 60-inch-diameter turning circle to allow unobstructed access.
 3. Signage: Apply a decal with the international symbol of accessibility to the face of ADA compliant locker doors.

2.7 FINISHES, GENERAL

- A. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.

- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils on doors and frames, and 1.1 mils elsewhere.
- C. Locker Colors: As selected from manufacturer's standard color range. A maximum of 5 colors will be selected.

PART - EXECUTION

3.1 INSTALLATION

- A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions. Anchor framing consist of 3 horizontal rows of continuous 2 x 4 wood framing behind lockers. Secure to wall with construction adhesive and cut nails.
- B. Anchor lockers to built up bases and walls at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners. Install lockers in accordance with details indicated on Drawings.
- C. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates. Attach recess trim to recessed lockers with concealed clips.
- D. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed lockers.
- E. Seal lockers to wall in accordance with local authority having jurisdiction.

3.2 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

- D. Touch up marred finishes to factory-finished appearance, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

SECTION 10 56 13 - METAL STORAGE SHELVING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Four post shelving.
- B. Metal storage shelving.
- C. Shelving accessories.
- D. J-Hooks.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
 - 1. In lieu of test reports, detailed drawings stamped and sealed by a Professional Engineer licensed in the State of Maryland will be acceptable.
- D. 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.
- E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.3 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.

1.4 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. 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, Div. of List Industries, Inc : www.hallowell-list.com/#sle.
 - 2. Penco Products, Inc : www.pencoproducts.com/#sle.
 - 3. Lyon Metal Products, Inc.
 - 4. Republic.

2.2 SHELVING - GENERAL

- A. See drawings for layout and sizes.
- B. Fabricate all units as initial shelving units with a post at each corner so that units may be moved or relocated by Owner as desired
- C. Shelving: Provide products tested to comply with ANSI MH28.1 for design criteria, lateral stability, shelf connections, and shelf capacity.
- D. Anchors: Provide anchoring hardware to secure each shelving unit to 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: 36 inches, center to center of posts.
 - 2. Capacity: Minimum 1,200 pound capacity for dead weight evenly distributed over a 36 inches wide x 18 inch deep shelf, including minimum 1.65 safety factor.
 - 3. Shelf Deflection: 1/4 inch in 36 inches, maximum, under rated uniform load.
 - 4. Adjustability of Shelving: At intervals of 1-1/2 inches on center maximum.
 - 5. Shelves per Unit: As indicated on drawings.
 - 6. Finish: Baked enamel, medium gloss.
 - 7. Color: As selected by Architect from manufacturer's standard range.
 - 8. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations may be exposed on face of members.
 - 1. Metal Thickness: 16 gage.
 - 2. Post Face Width: 2 inches, maximum.
 - 3. Connecting Hardware: Manufacturer's standard.
 - 4. Post Bases: Flat steel foot plate, with manufacturer's recommended adjustable leveling device.
- 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; welded, riveted, or bolted to uprights.
 - 4. Panel Sway Bracing: Formed sheet metal panels, 20 gage; welded, riveted, or bolted to uprights.
- D. Shelves: Formed sheet, finished on all surfaces .
 - 1. Metal Thickness: 16 gage.
 - 2. Shelf Edge Profile: Extending 3/4 inch, maximum, below top surface of shelf.
 - 3. Shelf Connection to Posts: Manufacturer's standard.

2.4 J-HOOKS

- A. Provide Tornado 40 lb. large steel J-Hooks, model 48034 or approved equal.
 - 1. Finish: Painted black.
 - 2. Size: Hook Length - 5.5 inches; Hook Diameter - 1.375 inches; Hook Opening - 3/4 inches.

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 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.

3.3 PROTECTION

- A. Clean area after installation.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 75 00 - FLAGPOLES**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes a ground-set flagpole made from aluminum.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles" unless governing jurisdiction provides other requirements.
 - 1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
 - 2. Basic Wind Speed: 100 mph; 3-second gust speed at 33 feet aboveground.

1.3 SUBMITTALS

- A. Product Data: For type of flagpole required.
- B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems.
 - 1. Include details of foundation system for ground-set flagpole.
- C. Structural Calculations: Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Qualification Data: For professional engineer.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Obtain flagpole as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.
 - 2. Obtain flagpole through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpole with heavy paper and enclose in a hard fiber tube or other protective container.

1.6 COORDINATION

- A. Provide anchoring devices to precast concrete manufacturer for casting.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Flagpole; a Kearney-National Inc. Company.
 - 2. Baartol Company Inc. (The)
 - 3. Concord Industries, Inc.
 - 4. Ewing International.
 - 5. Lingo Inc.; Acme Flagpole Division.
 - 6. Michigan Flagpole Inc.

7. Morgan-Francis Div.; Original Tractor Cab Co., Inc.
8. Pole-Tech Company Inc.

2.2 FLAGPOLE

- A. Flagpole Construction, General: Construct flagpole in one piece if possible. If more than one piece is necessary, comply with the following:
 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 2. For tapered flagpoles, provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- B. Quantity: One with accessories required to fly two flags at that same time.
- C. Exposed Height: 25 feet.
- D. Aluminum Flagpole:
 1. Provide cone-tapered flagpole fabricated from seamless extruded tubing complying with ASTM B 241, Alloy 6063, with a minimum wall thickness of 3/16 inch.
 2. Heat treat after fabrication to comply with ASTM B 597, Temper T6.
- E. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch minimum nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.
 1. Provide flashing collar of same material and finish as flagpole.
 2. Provide steel ground protectors extending 12 inches aboveground and 6 inches belowground for steel flagpoles where flashing collars are not provided.

2.3 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 1. 0.063-inch spun aluminum, finished to match flagpole.
- B. Internal Halyard, Cam Cleat System: 5/16-inch- diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock; provide minimum six keys. Finish truck assembly to match flagpole.
 1. Halyard Flag Snaps: Provide four chromium-plated bronze swivel snap hooks per halyard.
 2. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

- A. Concrete: Comply with requirements in Division 3 Section "Building Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi.
- B. Sand: ASTM C 33, fine aggregate.
- C. Elastomeric Joint Sealant: Multicomponent urethane joint sealant complying with requirements in Division 7 Section "Joint Sealers" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpole that is set in a foundation tube by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.
- D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.
- E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpole where shown and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION

SECTION 11 00 05 - MISCELLANEOUS EQUIPMENT**PART 1 GENERAL****1.1 SUMMARY**

- A. Section includes equipment not specified in other sections of the Project Manual.
- B. Furnish labor, materials, tools, equipment, services and supervision required to complete Work, including all incidental and complementary Work shown, specified or necessary to complete Work.
- C. Make all final connections for products included in this Section.
- D. Section includes:
 - 1. Kiln.
 - 2. Kiln Ventilator.
 - 3. Ice Machine.
 - 4. Changing Table.
 - 5. Maker Space Equipment.
 - 6. Calming Room Equipment.
 - 7. Cleaning Equipment.

1.2 SUBMITTALS

- A. Shop Drawings: Indicate locations, construction and anchorage details, dimensions and rough-in opening sizes.
- B. Product Data: Submit data for furnishings describing size, color and finish, details of function and attachment methods.
- C. Samples:
 - 1. When directed by the Architect, furnish samples showing full color range and other features of the product.
 - 2. Where applicable, furnish one of each type wall clip or anchoring device to install product to the building construction.
- D. Certify in writing that each product meets the specifications and can be installed in building where scheduled; certifications shall be produced and submitted following verification of site conditions.
- E. LEED Submittals: Comply with Section 018113.
 - 1. Water Efficiency Prerequisite 2: Indoor Water Use Reduction
 - a. Ice machine: ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
- F. Submit operation and maintenance data for electrically operated equipment.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum five years experience.

1.4 PROJECT CONDITIONS

- A. Verify measurements in field as required for Work fabricated to fit job conditions.
- B. Before ordering items or fabrication of Work, examine Drawings, job conditions, to assure good fit, neat installation.

PART 2 PRODUCTS

2.1 KILN

- A. Project Standard: Skutt Ceramic Products, Inc. (503)231-7726.
- B. Selection: Model: KM1227-3PK.
- C. Description: 28 inches diameter, 27 inches deep, 9.92 cubic feet, 410 pounds, temperature limit Cone 10 (2350 degrees).
 - 1. Provide "KilnMaster" Model KM-1227PK, 3 Phase, 208 Volts, 46.7 Amps, 14300 Watts, 6 gauge copper wire, 60 amp breaker, NEMA (refer also to the electrical drawings and specifications).
- D. Provide the #1227 Furniture Kit System (Large Tri-Post Assortment Kit and 8 - 1" half shelves).

2.2 KILN VENTILATOR

- A. Project Standard: Skutt Ceramic Products, Inc. (503)231-7726.
- B. Selection: Model: Enviro Vent 2.
- C. The ventilation system motor shall be 120 Volt, 1.4 Amps. Blower shall have static pressure and CFM capacities to suit project conditions.
- D. Provide ventilation system with vent piping, to connect to vent piping as indicated on mechanical drawings.
- E. Coordinate provision of disconnect switch and wiring by the electrical subcontractor, and hook up of ducting by the mechanical subcontractor.
 - 1. Provide kiln and ventilator with Skutt "EnviroLink".

2.3 ICE MACHINE

- A. Project Standard: Summit Appliance Division, Felix Storch, Inc.; Model BIM44GADA.
- B. Selection: Under counter compact cuber with storage.
 - 1. Size: 14-1/2 inches wide x 23-1/2 inches deep x 32-3/8 inches high.
 - 2. Capacity: Stores 25 lbs. of ice.
 - 3. Produces up to 50 lbs of ice in 24 hours.
- C. Provide external ice scoop and holder.
- D. ENERGY STAR labeled.

2.4 CHANGING TABLE

- A. Acceptable Products:
 - 1. Armedica; Hi-Lo AM-SX 1060 Child Size with safety belt; Imperial Blue.
 - 2. Harbor Medical; Mona.

2.5 MAKER SPACE EQUIPMENT

- A. Design is based on equipment scheduled on Drawings.

2.6 CALMING ROOM EQUIPMENT

- A. Design is based on equipment scheduled on Drawings.

2.7 CLEANING EQUIPMENT

- A. Design is based on equipment scheduled on Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Order items in ample time so as not to delay job progress with delivery at job site coordinated with other Work.
- B. Install in a thorough, workmanlike manner, in strict accordance with manufacturer's printed instructions and subject to inspection by the Architect.
- C. Assembly:
 - 1. Deliver factory-built units completely assembled in one piece without joints, whenever possible.
 - 2. Where dimensions exceed unit size, provide two or more pieces of equal length as acceptable to Architect and Owner.
 - 3. When overall dimensions require delivery in separate units, prefit at factory, disassemble for delivery, and make final joints at site.
 - 4. Use splines at joints to maintain surface alignment.
- D. Install units in locations and mounting heights as shown on Drawings, keeping perimeter lines straight, plumb and level.
- E. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories for complete installation.
- F. Coordinate job-assembled units with grounds, trim and accessories; join all parts with neat, precision fit.
- G. Verify accessories required for each unit properly installed and operating units properly functioning.

3.2 CLEANUP

- A. Remove temporary protective cover at completion.

END OF SECTION

SECTION 11 13 13 - LOADING DOCK BUMPERS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Dock bumpers of reinforced rubber with attachment frame.

1.2 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate unit dimensions, method of anchorage, and details of construction.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Dock Bumpers:
 - 1. Blue Giant Equipment Corporation: www.bluegiant.com/#sle.
 - 2. Chalfant Sewing Fabricators, Inc.: www.chalfantusa.com/#sle.
 - 3. Durable Corp: www.durablecorp.com/#sle.
 - 4. Pawling Corporation: www.pawling.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

- A. Bumpers: Fabric reinforced rubber pads, ozone resistant, laminated and compressed in position with two galvanized steel rods with threaded ends, washers and nuts; between 3 x 2-1/2 x 1/4 inch galvanized steel angle end plates:
 - 1. Projection From Wall: 4-1/2 inches.
 - 2. Vertical Height: 10 inches.
 - 3. Length: 15 inches.
- B. Attachment Hardware: 3/4 inch diameter galvanized bolts and expansion shields.
- C. Touch-up Primer: Zinc rich type.

PART 3 EXECUTION**3.1 INSTALLATION**

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.

END OF SECTION

SECTION 11 31 00 - APPLIANCES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Appliances.

1.2 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. LEED Submittals: Comply with Section 018113.
 - 1. WE Prerequisite 2: Indoor Water Use Reduction
 - a. Residential clothes washers: Product data indicating compliance with ENERGY STAR
 - b. Residential dishwashers (standard and compact): Product data indicating compliance with ENERGY STAR.
- D. 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. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.5 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS**2.1 APPLIANCES**

- A. The design for each appliance is based on products indicated on the Drawings.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify utility rough-ins are present 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 operating equipment to efficient operation.

3.4 CLEANING

- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

END OF SECTION

SECTION 11 40 00 – 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, mixing valves, backflow preventers, 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 standard 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. Where 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. Select Stainless, Inc.; Matthews, NC
 - 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. 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.

C. 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.

D. 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.

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- E. 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.
- F. 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.
- G. 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.
- H. Samples:
1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.
- I. 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.
- J. 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.
- K. LEED Submittals:
1. WE Prerequisite 2 and Credit 2: Indoor Water Use Reduction
 - a. Commercial dishwashers: Product data indicating compliance with ENERGY STAR.
 - b. Ice machine: Product data indicating compliance with ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
 - c. Food Steamer: Water usage in gallons per hour per pan
 - d. Combination Oven: Water usage in gallons per hour per pan

- e. Hand-Washing Sink Faucets, aerators: Product data indicating WaterSense Label and flow rate in gallons per minute (gpm)
- f. Spray rinse valves: Product data indicating flow rate in gallons per minute (gpm)
- 2. EA Prerequisite 4: Fundamental Refrigerant Management
 - a. Commercial refrigerators, freezers, ice makers, and water coolers: Product data for refrigerant listed in pounds.
- 3. 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 v1.1–2010 and VOC content in g/L. Include volume of material applied per product.

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 infer able 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) years 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 warranted 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, doorjamb, 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. 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 least (10) working days prior to date of bids, 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. If approved, bidders will be notified in the form of addendum.
- 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.

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-404A 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-0231.
 - b.) Fisher Manufacturing Company, Model 3253.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-0221.
 - b.) Fisher Manufacturing Company, Model 3313.
 - b. Pot Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-0290.
 - b.) Fisher Manufacturing Company, Model 5214.
2. Pre-Rinse Assemblies:
 - a. Splash-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-0133-BJ with B-0109 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-0143-01 with B-0107J spray valve, B-0510 mixing valve and B-0109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2810-WB with Ultra-Spray™/PLUS spray valve, 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.
3. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

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.

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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, degreased, 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°F.
 - 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.
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- b. Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 2-3/4" in diameter at the top, Component Hardware #A72-0811, 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, unfaced, 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 degree 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 centerline 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 un-crated, 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 Sil-Fos 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 de-greased.
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. Provide a follow-up kitchen demonstration three (3) months after the initial demonstration or kitchen opening. K.E.C. to coordinate scheduling with manufacturer's representatives.
3. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.

4. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.
5. 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 with stainless steel cleaner.
- 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 ITEMIZED EQUIPMENT

ITEM #1: FLY FAN -- (N.I.K.E.C. -- SPECIFIED BY MECHANICAL)

QUANTITY: One (1)

ITEM #2: UTILITY CART, MOBILE

QUANTITY: Four (4)
MANUFACTURER: Lakeside Manufacturing Company
MODEL NO.: 543 (N058)
PERTINENT DATA: 700-Lb. Capacity, Two-Shelf, N.S.F. Model
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Piper Products

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. All four (4) casters swivel-type.

ITEM #3: WALK-IN COOLER/FREEZER

QUANTITY: One (1)
MANUFACTURER: Thermo-Kool
MODEL NO.: Indoor Installation (N058)
PERTINENT DATA: 4" Thick Urethane Panel - Class I, NSF Construction
UTILITIES REQ'D: 1,300W, 120V, 1PH; (2) 3/4" IW
ALTERNATE MFRS.: Kolpak; Bally; ThermalRite

Furnish and install per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-102; Manufacturer's Shop Drawing and the following:

ITEM #3: (Continued)

1. Two-Section Unit, 22'-2" L x 9'-8" D x 9'-0" H. Interior width: Cooler - 10'-10", Freezer - 11'-3".
2. Exterior Finish:
 - 26 GA stucco embossed galvanized steel where unexposed.
 - 22 GA stucco embossed stainless steel where exposed.
3. Interior Finish:
 - White .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 6 MIL polyethylene sheets on building floor slab.
 - 2" setting bed with two (2) layers of wire reinforcing mesh fabric and quarry tile floor material with 6" high integral coved base, both interior and exterior of box, installed over prefabricated floor panel by Flooring Contractor.
5. Entrance Door:
 - Two (2) flush-mounted, self-closing, right-hand hinged doors with 34" x 76" net opening.
 - Polished chrome camlift hinges with lift off capability. Provide one (1) extra hinge per door, three (3) total.
 - Kason #1236 polished chrome lever-action handle with knob turn release and cylinder lock.
 - Kason #09440004 polished chrome dead-bolt lock, factory mounted.
 - Hydraulic door closer.
 - Mount Kason #1806 LED light fixture centered over door opening to avoid conflict with shelving, each compartment. Extend wiring for door frame heater and light fixture up in conduit, foamed within door panel, to junction box mounted on top of walk-in ceiling, each compartment.
 - Foot treadle door opener.
 - Standard 2" diameter dial indicating thermometer factory mounted in door frame, each compartment. Probe wires to be secured in wall with cable holders and stainless steel fasteners at 18" on center.
 - 36" high aluminum diamond tread kickplates, interior and exterior of door, frame and jamb.
 - 14" x 24" heated observation windows, both entrance doors.
 - Undercut doors for quarry tile floor.
 - Cool Curtain Clear-Vu Model #SS3678 vinyl swinging curtains factory installed at each entrance door. Trim curtains to not drag on floor.
 - 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.
 - 12 gauge heavy-duty stainless steel heated threshold, both compartments.
 - Engraved phenolic plastic compartment signs - 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.
6. One (1) heated pressure relief port in freezer.

ITEM #3: (Continued)

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.
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; K.E.C. to verify ceiling height.
10. Provide and install closure panels of matching exterior finish between top of walk-in and finish ceiling per Detail, Sheet K-102. K.E.C. to 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.
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. Drain line heating cable shall be installed for continuous 24-hour operation.
15. Coordinate location of sprinkler system nozzles 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. 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.
18. Accessories:
 - One (1) Mars Air LoPro #LPN36-IU air door curtain factory installed above each door with optional on/off microswitch. Electrical Contractor to provide power receptacle and final connection. Mount fan centered over walk-in door opening and attach to wall panel with thru-bolts.
 - #16 ga. stainless steel hat-channel bumper rail with closed ends installed to front face and left side 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. Align bumper rail with 36" high aluminum kickplate on doors.

ITEM #3: (Continued)

- 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.

ITEM #4: COOLER REFRIGERATION SYSTEM

QUANTITY: One (1)
MANUFACTURER: ColdZone
MODEL NO.: CFO100M4S-E (N058)
PERTINENT DATA: Uni-Pak, Air-Cooled, Outdoor Installation, With Demand Defrost Control & Remote Refrigeration Control
UTILITIES REQ'D: 5.1A, 208V, 3PH
ALTERNATE MFRS.: RDT; Omni-Temp

Furnish and install 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 Mechanical Roof Plan for exact location.
3. Complete winterization package and condensing unit weatherproof cover.
4. Overall size: 28.25 L x 28" W x 19" H.
5. Weight: 195 lbs.
6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6A094ADAEL; 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.
 - KE2Temp Defrost Controller to consist of a microprocessor driven controller that reduces the energy used by the evaporator coil in refrigeration systems through precise control of superheat, fan management and demand defrosts.
7. 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.
8. Factory installed main-fused disconnect switch.

ITEM #5: FREEZER REFRIGERATION SYSTEM

QUANTITY: One (1)
MANUFACTURER: ColdZone
MODEL NO.: CFO350L4S-E (N058)
PERTINENT DATA: Uni-Pak, Air-Cooled, Outdoor Installation, With Demand Defrost Control & Remote Refrigeration Control
UTILITIES REQ'D: 12.9A, 208V, 3PH
ALTERNATE MFRS.: RDT; Omni-Temp

Furnish and install 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 Mechanical Roof Plan for exact location.
3. Complete winterization package and condensing unit weatherproof cover.
4. Overall size: 28.25" L x 40" W x 22" H.
5. Weight: 255 lbs.
6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6E090DDAEL, 1.0A, 208V, 1PH (Fan); 9.8A, 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.
 - KE2Temp Defrost Controller to consist of a microprocessor driven controller that reduces the energy used by the evaporator coil in refrigeration systems through precise control of superheat, fan management and demand defrosts.
7. 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.
8. Factory installed main-fused disconnect switch.

ITEM #6: DUNNAGE RACK, MOBILE

QUANTITY: Two (2)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: With Wire Mat, Metroseal 3™ Epoxy-Coated
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #6: (Continued)

Cooler:

1. One (1) #HP33K3 Metroseal 3™ epoxy-coated unit; 18" W x 36" L.

Freezer:

1. One (1) #HP33K3 Metroseal 3™ epoxy-coated unit; 18" W x 36" L.

ITEM #7: SHELVING, MOBILE

QUANTITY: Ten (10)
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:

Cooler:

1. One (1) #MX1842G section; 18" W x 42" L x 4-tier high.
2. Four (4) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Twenty (20) #MX63UP polymer posts for stem casters, 63" high.
4. Ten (10) #5MPX polyurethane swivel casters with bumpers.
5. Ten (10) #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) #MX1842G sections; 18" W x 42" L x 4-tier high.
2. Three (3) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Twenty (20) #MX63UP polymer posts for stem casters, 63" high.
4. Ten (10) #5MPX polyurethane swivel casters with bumpers.
5. Ten (10) #5MPBX polyurethane swivel casters with brakes and bumpers.

ITEM #7: (Continued)

6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #8: DUNNAGE RACK, MOBILE

QUANTITY: One (1)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: With Wire Mat, Metroseal 3™ Epoxy-Coated
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. One (1) #HP55K3 Metroseal 3™ epoxy-coated unit; 24" W x 48" L.

ITEM #9: SHELVING

QUANTITY: Thirteen (13)
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) #MQ2442G sections; 24" W x 42" L x 5-tier high.
2. Nine (9) #MQ2448G sections; 24" W x 48" L x 5-tier high.
3. Fifty-two (52) #MQ74PE polymer posts, 74" high.
4. Plastic wedge lock connectors, quantity as required.
5. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #10: PASS-THRU HEATED CABINET, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RHF132WP-FHG/FHS (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Interior/Exterior
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 doors hinged per Equipment Plan. Glass doors on kitchen side, solid doors on serving side.
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. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.
7. Cord and plug set with matching receptacle furnished and installed by Electrical Contractor.

ITEM #11: PASS-THRU REFRIGERATOR, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RHT132NPUT-FHG/FHS (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Interior/Exterior
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 doors hinged per Equipment Plan. Glass doors on kitchen side, solid doors on serving side.
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.

ITEM #11: (Continued)

6. Plastic laminate finish factory applied to exterior door fronts on serving side only; color as selected by Architect; K.E.C. to verify.
7. Cord and plug set.

ITEM #12: WORKTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 6'-0" Long x 2'-6" Wide x 3'-0" 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 end edge roll per Detail 1.02M.
2. 6" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Stainless steel undershelf per Detail 1.11.
6. One (1) stainless steel drawer assembly per Detail 1.14, Type I, with lock.
7. Worktable per Detail 2.01.
8. Sound-deaden underside of tabletop with NSF-approved sound dampening material.
9. Accessories:
 - One (1) Edlund #S-11C manual can opener.

ITEM #13: FRUIT SECTIONIZER

QUANTITY: One (1)
MANUFACTURER: Sunkist
MODEL NO.: S-105
PERTINENT DATA: 3-in-1, 2 halves scored in 3 wedges ea., NSF Listed
UTILITIES REQ'D: ---
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #13: (Continued)

1. Accessories:
 - 6 slice Blade cup, w/cover, fits S-10 (S-4B)
 - Plunger slicer, fits part S-04, 6 wedge blade cup (S-10)
 - 8 wedge blade cup (S-29B)
 - Apple Plunger, fits S-32 (S-33, S-32)
 - Apple corer cup, fits S-33 (S-32B)
 - Plastic production stand (S-31)

ITEM #14: WORKTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 6'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-5 and the following:

1. Front and end edge roll per Detail 1.02M.
2. 6" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Stainless steel undershelf per Detail 1.11.
6. One (1) stainless steel drawer assembly per Detail 1.14, Type I, with lock.
7. Worktable per Detail 2.01.
8. Sound-deaden underside of tabletop with NSF-approved sound dampening material.

ITEM #15: FOOD PROCESSOR

QUANTITY: One (1)
MANUFACTURER: Robot Coupe USA, Inc.
MODEL NO.: R-602VV (N058)
PERTINENT DATA: Continuous Feed Hopper, Dual Purpose, Variable Speed, 7-Qt. Bowl
UTILITIES REQ'D: 20A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #15: (Continued)

1. Standard food processor package consisting of: food processor, 7-qt. stainless steel bowl, continuous feed vegetable preparation attachment, (1) #28058 1/8" grating disc and (1) #28064 1/8" slicing disc.
2. Accessories:
 - One (1) #R255 disc rack.
3. Cord and plug set.

ITEM #16: HAND SINK

QUANTITY: Four (4)
MANUFACTURER: Eagle Foodservice Equipment
MODEL NO.: HSA-10-FAW-LRS (N058)
PERTINENT DATA: Wall Mounted, Wrist Handle Faucet
UTILITIES REQ'D: 1/2" CW, 1/2" HW, 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 #17: SOAP & TOWEL DISPENSER -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: Four (4)

ITEM #18: WORKTABLE

QUANTITY: Two (2)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 6'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-5 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.

ITEM #18: (Continued)

4. Stainless steel undershelf per Detail 1.11.
5. One (1) stainless steel drawer assembly per Detail 1.14, Type I, with lock.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of tabletop with NSF-approved sound dampening material.
8. Two (2) 20A, 120V receptacles with stainless steel coverplate mounted on each end. Pre-wire to junction box mounted below undershelf and conceal wiring within tubular leg.

ITEM #19: PREP SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO: #14 GA Stainless Steel
PERTINENT DATA: 8'-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 partial right end edge rolls per Detail 1.02B.
2. 13" high back, left and partial right end splash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
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-SB 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. Post sign on wall above sink tubs in English and Spanish stating: **WARNING! NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.**

ITEM #20: CONDENSATE CANOPY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO.: 6630-VHB-G-PSP-F (N058)
PERTINENT DATA: Stainless Steel, Non-Grease, Heat/Vapor Removal Only Type, Perforated Supply Plenum Make-Up Air
UTILITIES REQ'D: 1,800 CFM Exhaust; 1,440 CFM Supply; 350W, 120V, 1PH (Lights); 3/4" IW
ALTERNATE MFRS.: Gaylord; Avtec

Furnish and install per Equipment Plan, Sheet K-101; Condensate Canopy Detail Drawing, Sheet K-502; Manufacturer's Shop Drawing and the following:

1. 12'-0" long x 5'-6" wide x 2'-6" high, with bottom edge mounted at 6'-8" A.F.F. Length comprised of one (1) 12'-0" long section. Entire unit constructed of 18 GA stainless steel type 304 with liquid tight all welded external continuous seams and joints.
2. Three (3) U.L. Listed, NSF-Approved, 12" x 12" recessed LED light fixtures, equally spaced.
3. On/Off fan and light switches furnished and installed by Electrical Contractor.
4. Matching stainless steel perimeter closure panels to finished ceiling by K.E.C.; verify ceiling height.
5. Hanger rods and support system from structure above by other contract. K.E.C. to coordinate method and location with other trades.
6. Integral stainless steel hanger brackets.
7. Full-length, perforated stainless steel front-mounted make-up air plenum with integral supply air balancing dampers.
8. 1" wide full-perimeter integral gutter with 3/4" turn-up and 3/4" stainless steel drain connection.
9. Accessories:
 - Field wrapper.
 - Structural front panel.
 - #18 gauge stainless steel wall flashing full length of hood to extend from top of finish floor covered base up to bottom edge of hood body. Attach to wall with non-exposed fasteners and seal with clear silicone sealant.

ITEM #21: CONVECTION STEAMER

QUANTITY: One (1)
MANUFACTURER: AccuTemp Products, Inc.
MODEL NO.: E64803E140 DBL (N058)
PERTINENT DATA: (2) Double Stacked 6-Pan, Stand-Mounted Connected Boilerless, Evolution Series
UTILITIES REQ'D: (2) 14.0KW, 480V, 3PH; (2) 3/4" HW, (2) 3/4" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #21: (Continued)

1. Accessories:
 - #SNH-21-00 heavy-duty stainless steel support stand with adjustable bullet feet.
 - One (1) Everpure #EV9797-22 KleenSteam II Twin System Water Filter.
2. Two (2) cord and plug sets.
3. Backflow preventor furnished and installed by Plumbing Contractor.

ITEM #22: COMBI OVEN

QUANTITY: One (1)
MANUFACTURER: Rational Cooking Systems, Inc.
MODEL NO.: SCC-102E/SCC-62E (N058)
PERTINENT DATA: Combi-Duo, Full Size, Self-Contained, SelfCookingCenter® with Care Control
UTILITIES REQ'D: 37KW, 480V, 3PH; 3/4" CW, 2" IW/22.1KW, 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. Accessories:
 - One (1) #60.74.069 combi-duo open stacking kit, stationary.
 - Six (6) #6019.1150 stainless steel 12" x 20" fry baskets.
 - Ten (10) #6010.2101 stainless steel 24" x 20" wire racks.
 - Rational Certified Installation.
 - Installation kit.
 - Chef Assistance Program.
 - Six (6) #60.71.157 multi-baker, 12"x20".
 - One (1) bucket #56.00.210 cleaner tablet.
 - One (1) bucket #56.00.562 care tablet.
 - One (1) #1900.1154US Water Filtration Single Cartridge System, mounted on wall behind Combi-Oven.
 - One (1) Dormont #W508B2Q48 1/2" diameter x 48" long flexible water connector with quick-disconnect.
2. Cord and plug set.
3. Backflow preventor furnished and installed by Plumbing Contractor.

ITEM #23: CONVECTION OVEN

QUANTITY: One (1)
MANUFACTURER: Blodgett Oven Company, Inc.
MODEL NO.: ZEPHAIRE E PLUS DOUBLE (N058)
PERTINENT DATA: Double Section, Bakery Depth
UTILITIES REQ'D: (2)11.0KW, 480V, 3PH
ALTERNATE MFRS.: None

ITEM #23: (Continued)

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.
 - Plus Package: Dependent glass doors, interior lights, 2-speed fan.
2. Standard compliment of wire racks.
3. Cord and plug set, each deck.

ITEM #24: 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 #25: ICE MACHINE/BIN

QUANTITY: One (1)
MANUFACTURER: Hoshizaki America, Inc.
MODEL NO.: KML-500MAJ/B-500-SF
PERTINENT DATA: Air-Cooled, 442-LB. Maker, 500-LB. Bin, Low-Profile Type
UTILITIES REQ'D: 7.6A, 120V, 1PH; ½" CW, ¾" IW (Maker Drain), ¾" IW (Bin Drain)
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) #H9320-51 single configuration Water Filtration System. System mounted by K.E.C. Final connection by Plumbing Contractor.
 - 6" high stainless steel legs with adjustable bullet feet.
 - Custom fabricated ice scoop holder mounted on right-hand side of bin per Detail Sheet K-501.
3. Backflow preventor furnished and installed by Plumbing Contractor.

ITEM #26: SERVING COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: Modular Stainless Steel Interlocking Sections (N058)
PERTINENT DATA: L-Shaped Configuration, #14 Gauge S/S Tops
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Colorpoint by Low Temp Industries, Inc.

Refer to individual counter components listed under alpha headings for specification.

ITEM #26A: COMBINATION HOT/COLD FOOD COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SC-74-NU-MOD, N8669 (N058)
PERTINENT DATA: Open Base, With Five (5) Wells
UTILITIES REQ'D: 42.0A, 120/208V, 1PH; 3/4" IW
ALTERNATE MFRS.: Colorpoint by Low Temp Industries, Inc.

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 mounted on rigid brackets.
2. (E) - 6" wide, full-length solid stainless steel fold-down work shelf on server's side.
3. FlexiShield® #DCFSFS full -length food shields with stainless steel finish uprights, LED lights with shatterproof shield and on/off switch.
4. (F) - Line-up interlocks for counter body and tray slide.
5. Provide cut-out in top for drop-in self-contained 5-pan hot/cold unit. Locate compressor assembly to end and conceal within isolated compartment with lift-off louvered access panel, server's side. Remainder of base counter shall have open understorage with bottom stainless steel shelves.
6. (P) - Open understorage with bottom and intermediate stainless steel shelf.
7. Cord and plug set. Double cord hooks on bottom of unit.
8. Standard counter height of 36" A.F.F. Turn both ends down to align and interlock with adjacent solid top counter.
9. Exterior body color as selected by Architect; K.E.C. to verify.
10. Accessories:
 - T&S #B-0205LN deck-mounted single pantry fill faucet with #B-0208 swivel nozzle mounted on end opposite frost top counter.
 - One (1) Delfield #N8669 drop-in hot & cold combination 5- pan, 42.0A, 120V, 1PH .

ITEM #26B: FROST TOP COUNTER

QUANTITY: One (1)
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.: ColorPoint 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 L-shaped solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. FlexiShield® #DCFSFS full -length 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) – 6" high stainless steel legs with adjustable bullet feet.
6. (P) - Open understorage with bottom stainless steel shelf.
7. Modify length of frost top and food protector to provide an opening adjacent Item #26A: Combination Hot/Cold Food Counter for clear passage of 12"x20" tray.
8. Modified counter height of 30" A.F.F.
9. Provide drain line less shut-off valve. Plumber to extend copper drain line to nearest floor sink.
10. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #26C: CORNER SOLID TOP COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SC-50-NU-MOD (N058)
PERTINENT DATA: Open Base, 50" Long
UTILITIES REQ'D: ----
ALTERNATE MFR.: ColorPoint 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 mounted on rigid brackets @ 29" A.F.F.
2. (F) - Line-up interlocks for counter body and tray slide.
3. Cord and plug set. Double cord hooks on bottom of unit.

ITEM #26C: (Continued)

4. Provide cut-out in top for Item #28: Drop-In Ice Cream Cabinet.
5. Modified counter height of 30" A.F.F.
6. Open understorage with bottom and intermediate stainless steel shelf.
7. (V) - 6" high stainless steel legs with adjustable bullet feet.
8. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #26D: CASHIER STAND

QUANTITY: One (1)
MANUFACTURER: Shelbesteel by The Delfield Company
MODEL NO.: SCS-36-MOD (N058)
PERTINENT DATA: 25" Wide x 36" Long
UTILITIES REQ'D: 15A, 120V, 1PH (Dedicated Service)
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

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. (Q) - One (1) duplex receptacle mounted in counter base. Provide die-raised opening in top for power cord access.
3. (V) - 6" high stainless steel legs with adjustable bullet feet.
4. Utility drawer assembly with locking provision mounted on end.
5. Cord and plug set. Double cord hooks on bottom of unit.
6. Standard counter working height of 36" A.F.F. Turn end down to align and interlock with adjacent ice cream counter.
7. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #27: CASH REGISTER -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Three (3)

ITEM #28: DROP-IN ICE CREAM CABINET

QUANTITY: Three (3)
MANUFACTURER: Delfield
MODEL NO.: N225P (N058)
PERTINENT DATA: Drop-In, Stainless Steel Top & Lid
UTILITIES REQ'D: 1.8A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Accessories:
 - #N225P-LK lock bar kit, each unit.
 - #3234189 transparent lid, per pan opening.
2. Cord and plug set.

ITEM #29: SERVING COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: Modular Stainless Steel Interlocking Sections (N058)
PERTINENT DATA: T-Shaped Configuration, #14 Gauge S/S Tops
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Colorpoint by Low Temp Industries, Inc.

Refer to individual counter components listed under alpha headings for specification.

ITEM #29A: HOT FOOD COUNTER

QUANTITY: Two (2)
MANUFACTURER: Shelleysteel 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.: ColorPoint 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.
2. (E) - 8" wide, full-length solid stainless steel fold-down work shelf on server's side.
3. (G) - Sloped front food protector with tempered glass front and fixed end panels.
4. (L) - LED light fixture.

ITEM #29A: (Continued)

5. (M) - Radiant heat lamp.
6. (F) - Line-up interlocks for counter body and tray slide.
7. Cord and plug set. Double cord hooks on bottom of unit.
8. (V) – 6" high stainless steel legs with adjustable bullet feet.
9. (P) - Open understorage with bottom stainless steel shelf.
10. (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 #29B with stainless steel hinged access door per Detail Sheet K-103.
11. Standard counter height of 36" A.F.F. Turn both end down to align and interlock with adjacent frost top counter.
12. Exterior body color as selected by Architect; K.E.C. to verify.
13. Accessories:
 - T&S #B-0205LN deck-mounted single pantry fill faucet with #B-0208 swivel nozzle mounted on end opposite frost top counter.

ITEM #29B: FROST TOP COUNTER

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.: ColorPoint 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 L-shaped solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. FlexiShield® #DCFSFS full -length 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) – 6" high stainless steel legs with adjustable bullet feet.
6. (P) - Open understorage with bottom stainless steel shelf.

ITEM #29B: (Continued)

7. Modify length of frost top and food protector to provide an opening adjacent Item #29A: Hot Food Counter for clear passage of 12"x20" tray.
8. Modified counter height of 30" A.F.F.
9. Provide drain line less shut-off valve. Plumber to extend copper drain line to nearest floor sink.
10. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #29C: SOLID TOP COUNTER

QUANTITY: Two (2)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SC-28-NU-MOD (N058)
PERTINENT DATA: Open Base, 28" Long
UTILITIES REQ'D: ----
ALTERNATE MFR.: ColorPoint 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 mounted on rigid brackets @ 29" A.F.F..
2. (F) - Line-up interlocks for counter body and tray slide.
3. Cord and plug set. Double cord hooks on bottom of unit.
4. Provide cut-out in top for Item #28: Drop-In Ice Cream Cabinet.
5. (V) - 6" high stainless steel legs with adjustable bullet feet.
6. (P) - Open understorage with bottom stainless steel shelf.
7. Modified counter height of 30" A.F.F.
8. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #29D: SOLID TOP COUNTER

QUANTITY: One (1)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SC-60-NU-MOD (N058)
PERTINENT DATA: Open Base, 60" Long
UTILITIES REQ'D: ----
ALTERNATE MFR.: ColorPoint by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

ITEM #29D: (Continued)

1. (F) - Line-up interlocks for counter body.
2. Open understorage with bottom and intermediate stainless steel shelf.
3. (V) - 6" high stainless steel legs with adjustable bullet feet.
4. Modified counter height of 30" A.F.F.
5. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #29E: CASHIER STAND

QUANTITY: Two (2)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SCS-36-MOD (N058)
PERTINENT DATA: 30" Long x 36" Wide
UTILITIES REQ'D: 15A, 120V, 1PH (Dedicated Service)
ALTERNATE MFRS.: ColorPoint by Low-Temp Industries

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. (Q) - One (1) duplex receptacle mounted in counter base. Provide die-raised opening in top for power cord access.
3. (V) - 6" high stainless steel legs with adjustable bullet feet.
4. Utility drawer assembly with locking provision mounted on end.
5. Cord and plug set. Double cord hooks on bottom of unit.
6. Standard counter working height of 36" A.F.F. Turn end down to align and interlock with adjacent ice cream counter.
7. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #30: NAPKIN & CONDIMENT DISPENSER

QUANTITY: Two (2)
MANUFACTURER: Dispense-Rite
MODEL NO.: NLO-SWNH (N058)
PERTINENT DATA: Countertop, Black Polystyrene
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

ITEM #30: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101 and Manufacturer's Instructions.

ITEM #31: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: STF34HC-1-S (N058)
PERTINENT DATA: 34" Wide, Dual Access, 8-Case Capacity, Forced-Air Type, R290 Hydrocarbon Refrigerant
UTILITIES REQ'D: 4A, 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.
4. Swivel casters with brakes.
5. Accessories:
 - #00C01-012A-01 corner bumper kit, each unit.

ITEM #32: ELECTRIC MENU BOARD -- (N.I.K.E.C. – FURNISHED BY OWNER)

QUANTITY: Three (3)

ITEM #33: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: SMF34HC-1-S
PERTINENT DATA: 34" Wide, Single Access, 8-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.

ITEM #33: (Continued)

3. Cylinder lid lock.
4. Swivel casters with brakes.
5. Accessories:
 - #00C01-012A-01 corner bumper kit.

ITEM #34: 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 #35: ROLL-DOWN DOOR -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: One (1)

ITEM #36: SOILED DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 9'-0"± x 4'-0" 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 left end splash per Detail 1.04A.

ITEM #36: (Continued)

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"x20" 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. Raise deck at rear of sink 6" for deck-mounted pre-rinse spray and extend to opening of dishmachine to act as rack guide.
9. Bottom of pre-rinse sink fitted with Component Hardware #D63-4161 box patten drain assembly.
10. Sound-deaden underside of sink and drainboard with NSF-approved sound dampening material.
11. Accessories:
 - One (1) T&S #B-0113-BJ deck-mounted pre-rinse spray with #B-0109-01 wall bracket.

ITEM #37: TRASH CONTAINER, MOBILE

QUANTITY: One (1)
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:
 - One (1) #FG264000BLA conversion dolly.
 - One (1) #FG263100GRAY matching flat lid.

ITEM #38: 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

ITEM #38: (Continued)

Fabricate and install per Equipment Plan, Sheet K-101; and the following:

1. Constructed and installed per Detail 5.06.

ITEM #39: 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.
7. Left-to-right 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 #40: CLEAN DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 5'-6" 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 right 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.
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 #39) in end of dishtable, interwired by Electrical Contractor.

ITEM #41: POT & PAN SHELVEING, MOBILE

QUANTITY: One (1)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax i (N058)
PERTINENT DATA: Four-Tier High, 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:

1. One (1) #MX2448G section; 24" W x 48" L x 4-tier high.
2. Four (4) #MX63UP polymer posts, 63" high.
3. Two (2) #5MPX polyurethane swivel casters with bumpers.
4. Two (2) #5MPBX polyurethane swivel casters with brakes and bumpers.
5. Plastic wedge lock connectors, quantity as required.

ITEM #41: (Continued)

6. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.
7. Accessories:
 - One (1) #MTR2448XE tray drying rack.
 - Five (5) #MXD24-8 shelf dividers.

ITEM #42: POT WASHING SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: L-Shaped Configuration: 9'-7 1/2"± x 8'-2"± 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 and Fabrication Detail, Sheet K-501, and the following:

1. Front and right end edge roll per Detail 1.02B.
2. 13" high back and left 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. Stainless steel undershelf on both ends per Detail 1.11.
7. Full length table-mounted stainless steel overshelf per Detail 1.12
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.
 - Two (2) T&S #B-3950-01-SB twist waste valves with overflow assemblies and #010387-45 basket strainers.
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. Post sign on wall above sink tubs in English and Spanish stating: WARNING! NOT TO BE USED BY CONSTRUCTION TRADES. FAILURE TO COMPLY WILL RESULT IN \$500.00 FINE AND ALL COSTS TO REPLACE ITEM WITH NEW.

ITEM #43: MOP SINK & RACK -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL)

QUANTITY: One (1)

ITEM #44: SHELVING

QUANTITY: Three (3)
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:

Non-Food Storage:

1. Two (2) #MQ2136G sections; 21" W x 36" L x 5-tier high.
2. One (1) #MQ2160G section; 21" W x 60" L x 5-tier high.
3. Twelve (12) #MQ74PE polymer posts, 74" high.
4. Plastic wedge lock connectors, quantity as required.
5. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #45: WASHER -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

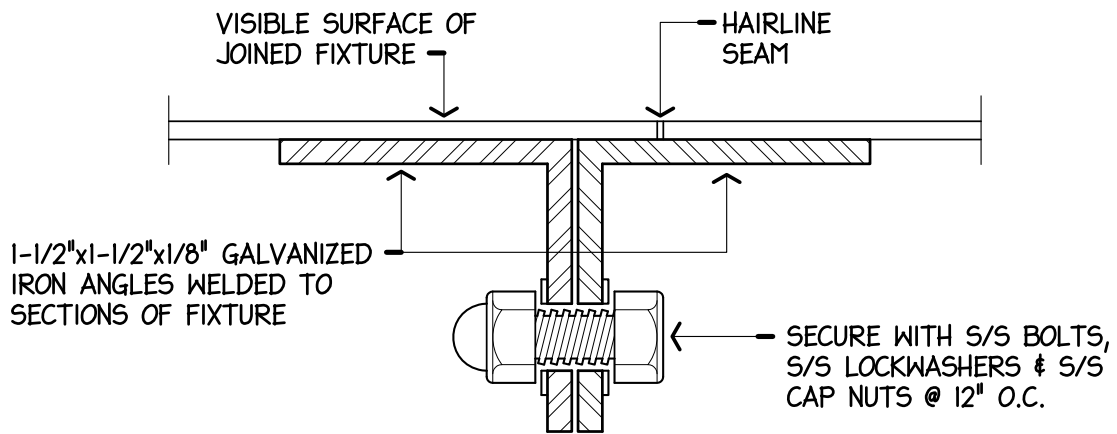
QUANTITY: One (1)

ITEM #46: DRYER -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: One (1)

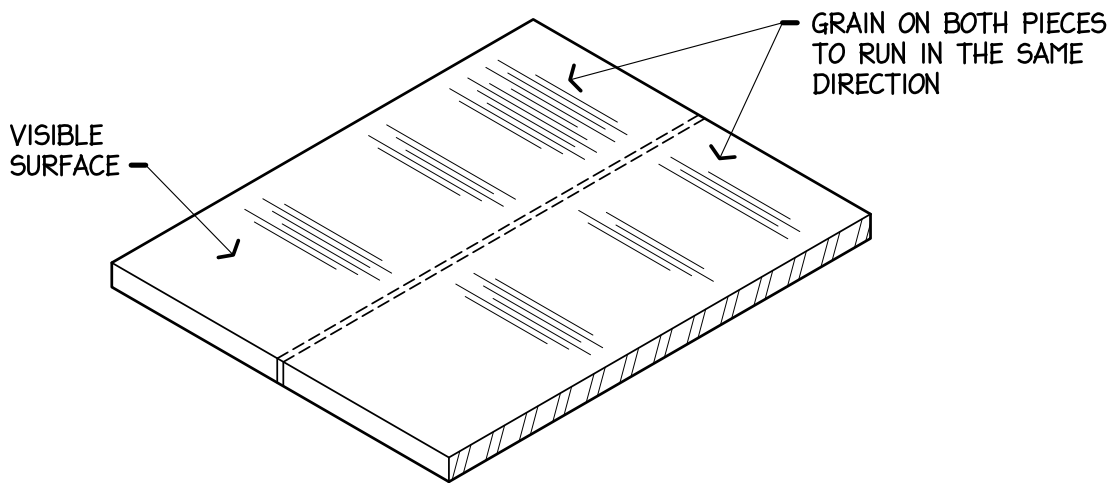
(END OF FOODSERVICE ITEMIZED SPECIFICATIONS)

STANDARD DETAILS



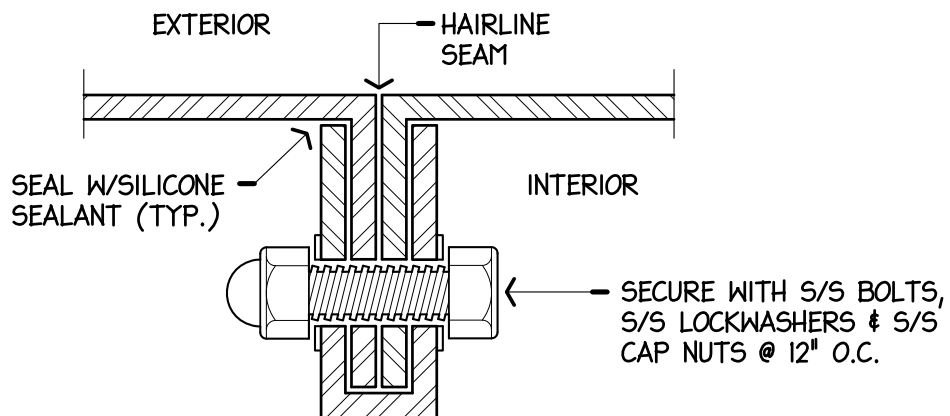
NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT



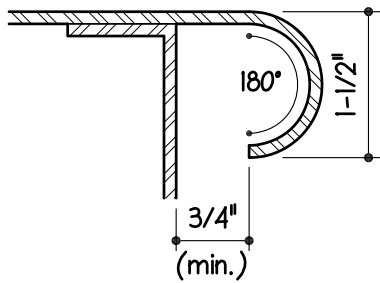
NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT

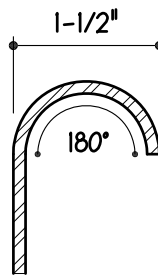


NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

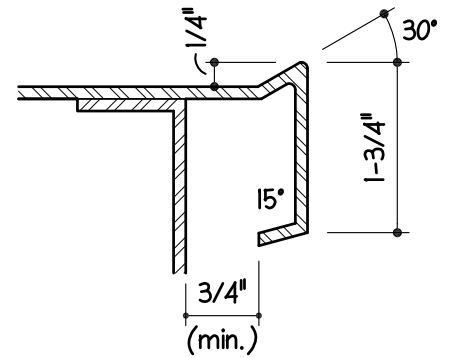
C. RAISED CAP SEAM - KNUCKLE JOINT



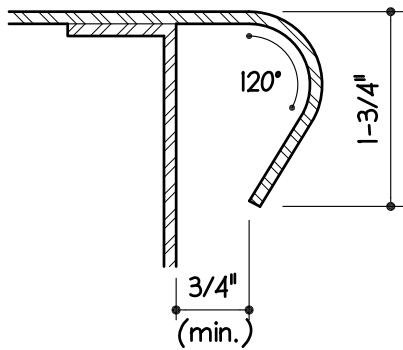
ROLLED A.



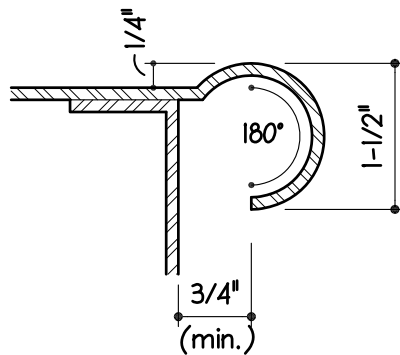
RAISED ROLLED B.



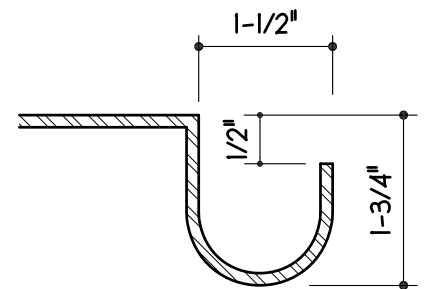
INVERTED "V" EDGE C.



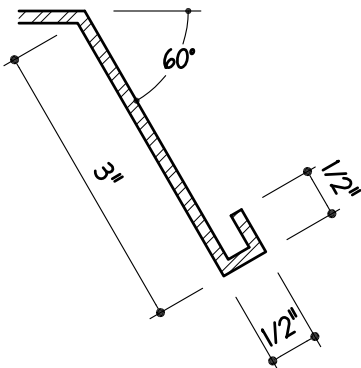
BULL NOSE ROLLED D.



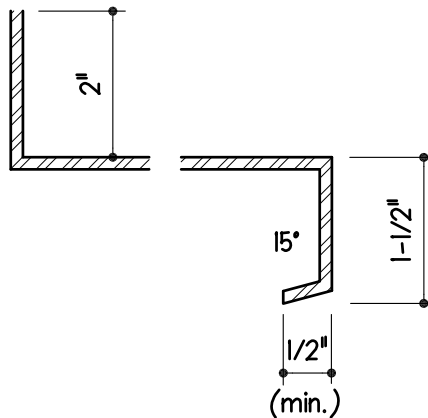
MARINE EDGE E.



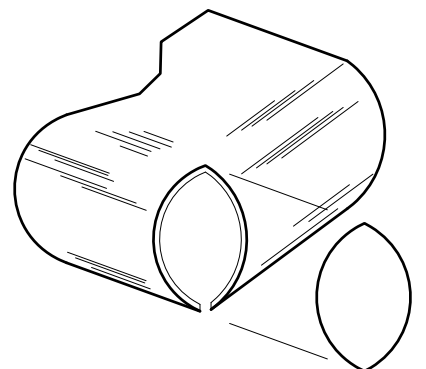
FLOUR GUTTER F.



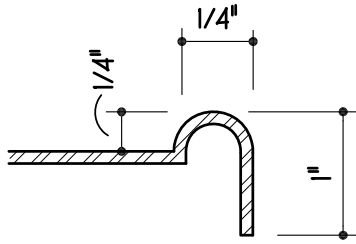
RECIPE CARD HOLDER G.



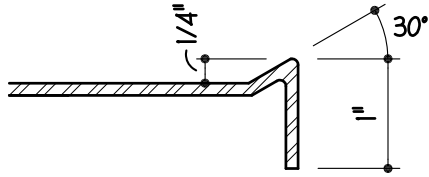
UNDERSHELF EDGE H.



BULL NOSE CORNER I.

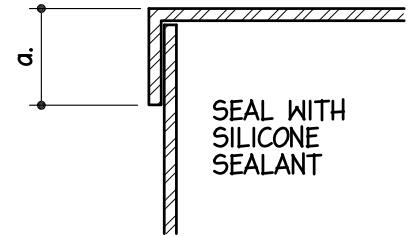


RAISED OPENING EDGE J.

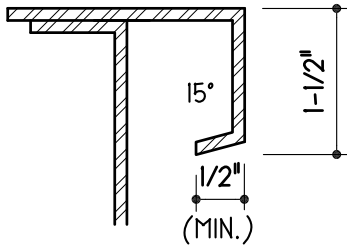


RAISED OPENING EDGE K.

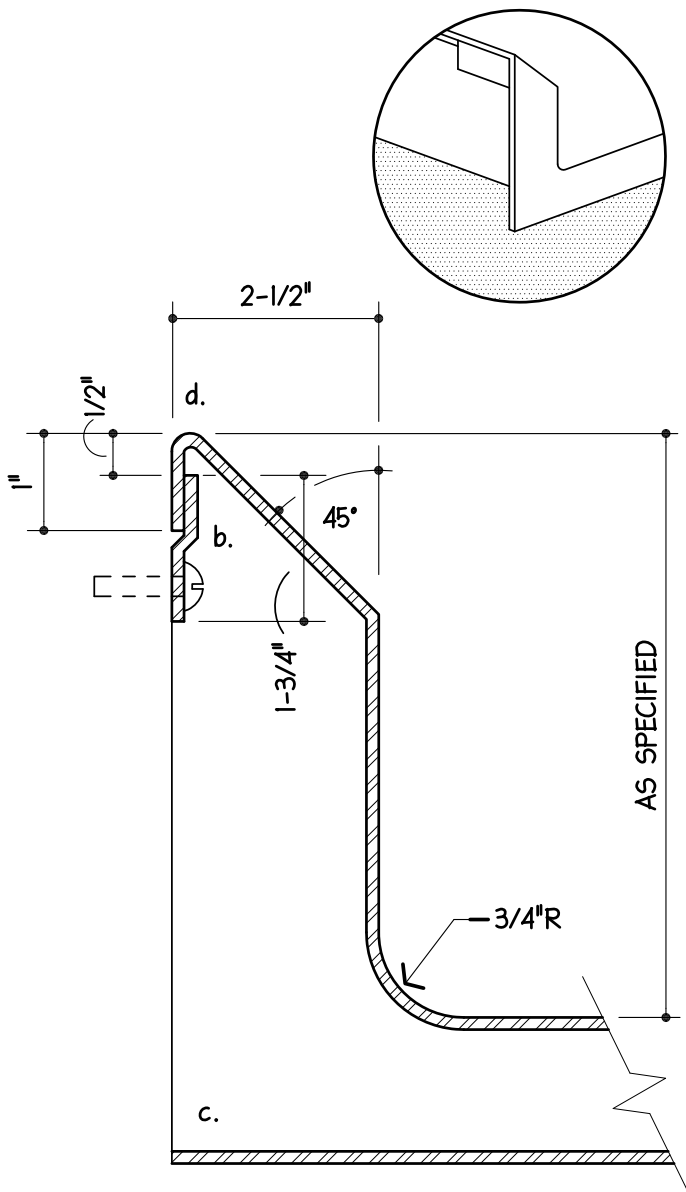
a. AS SPECIFIED. TO
MATCH ADJACENT
ROLLED EDGES



STRAIGHT TURN DOWN L.



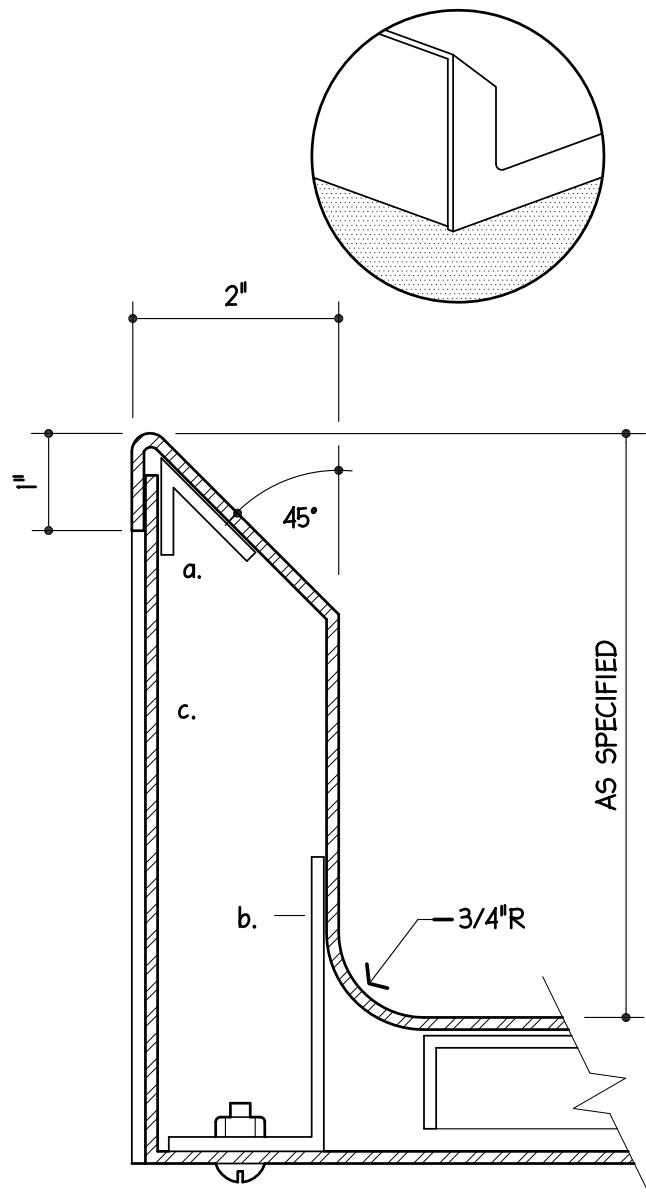
TURNED DOWN EDGE M.



WALL UNIT

DETAIL A

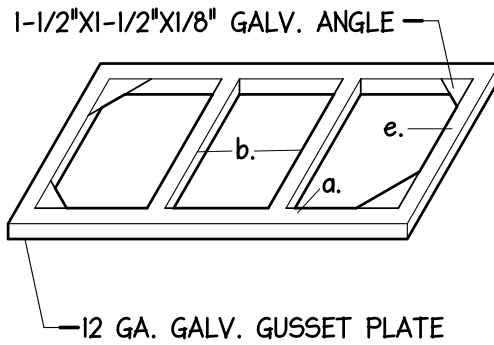
- 2-1/2" AT SINK TO ALLOW FOR CONNECTED OVERFLOW
- 12 GA. S/S CLIPS, 4" LONG, FASTENED TO EACH WALL END OF EACH UNIT & 4'-0" ON CENTER. SECURE TO WALL W/A MINIMUM OF TWO 1/4"x20 S/S TOGGLE BOLTS OR EXPANSION SHIELDS.
- EXPOSED ENDS TO BE FULLY WELDED CLOSED.
- SEAL ALL AROUND TO WALL WITH SILICONE SEALANT.



FREE STANDING UNIT

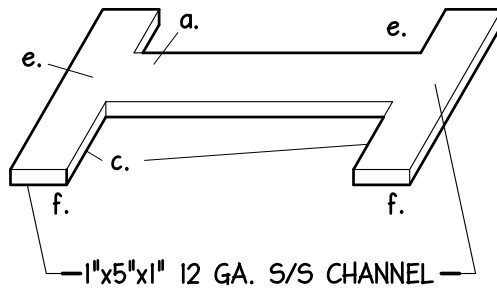
DETAIL B

- 1"x1"x14 GA. S/S x1-1/2" LONG RETAINING CLIP WELDED IN PLACE. ONE AT EACH END OF UNIT AND 12" ON CENTER.
- 2-1/2"x1-1/2"x1-1/2" 14 GA. S/S CLIP WELDED TO SPLASH. ONE AT OF EACH UNIT & 12" ON CENTER.
- 14 GA S/S PANEL SECURED TO CLIPS W/ S/S OVALHEAD BOLT. WELD NUT TO CLIP.
- EXPOSED ENDS TO BE FULLY WELDED.



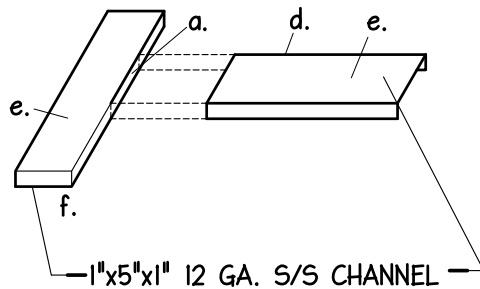
TABLES

A.



DISHTABLES

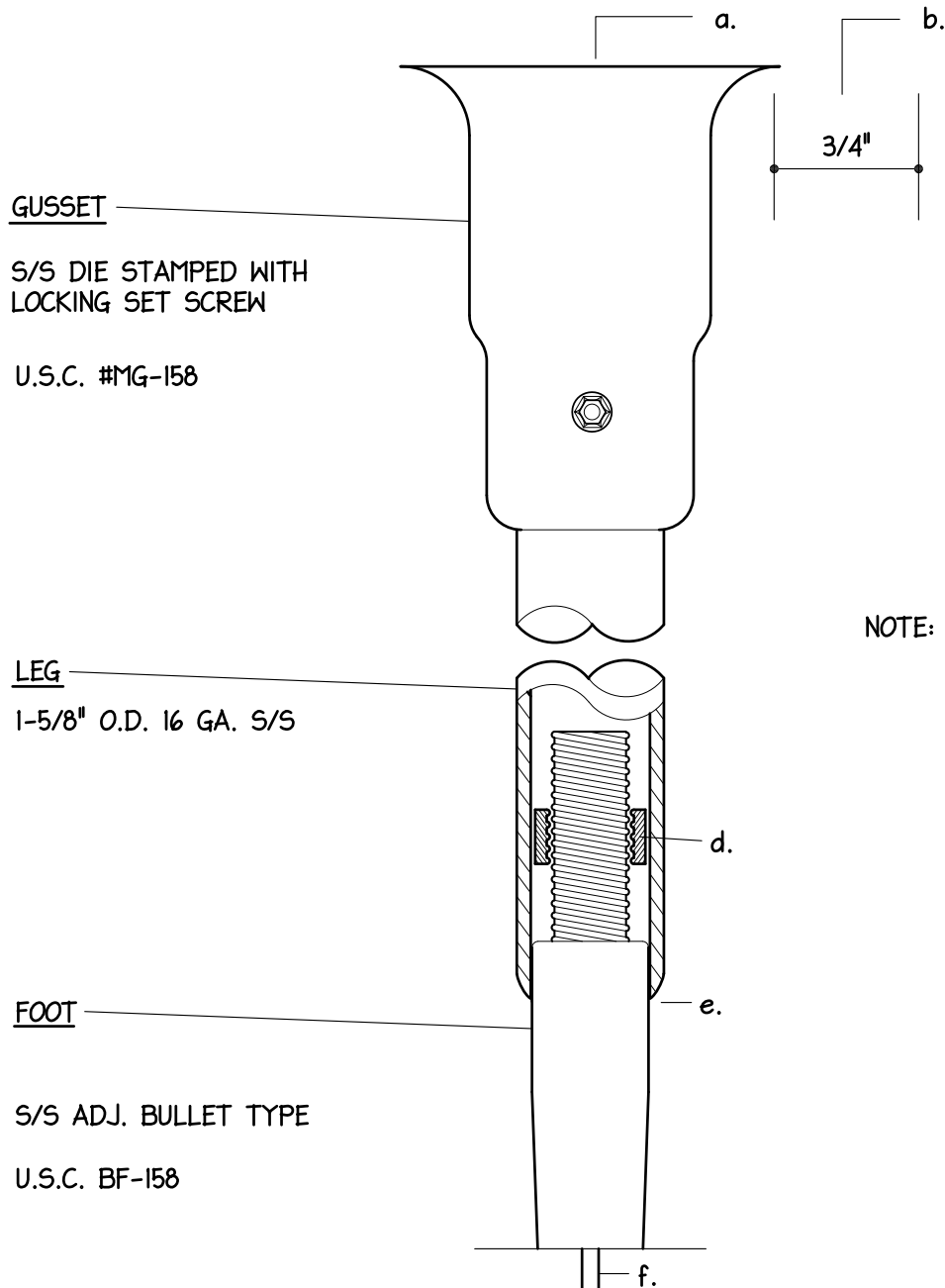
B.



SINK DRAINBOARDS

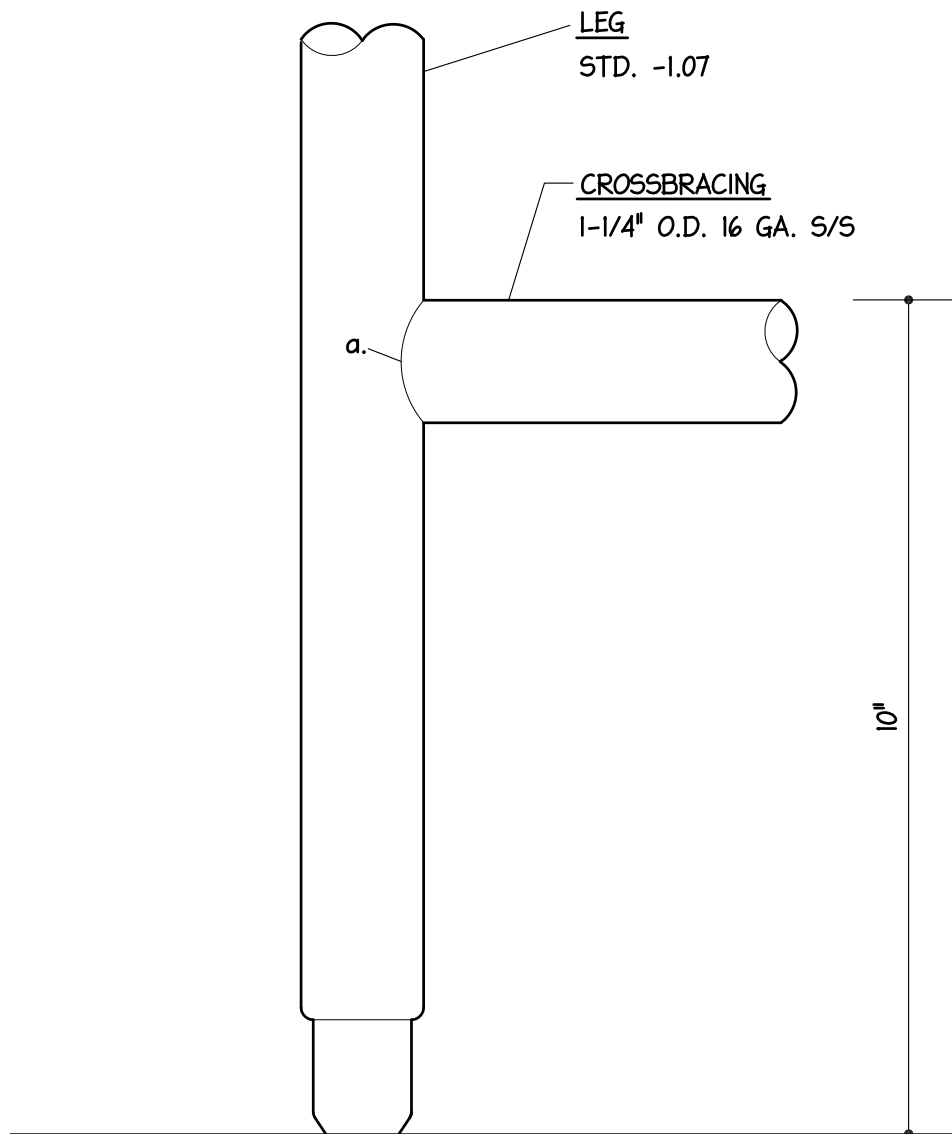
C.

- 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.

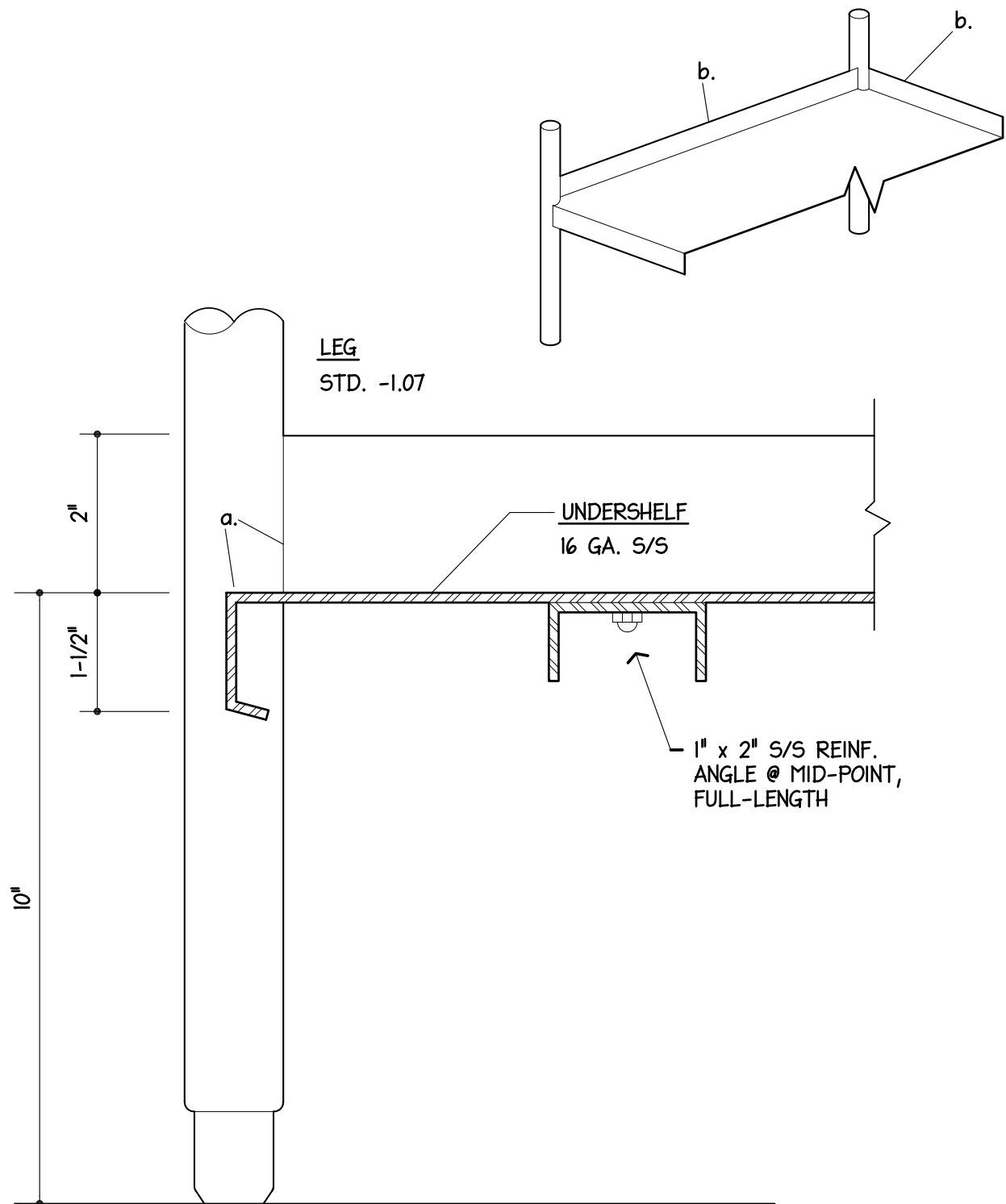


NOTE: ENTIRE FINISHED
STRUCTURE AND
INDIVIDUAL COMPONENTS
TO MEET NSF
REQUIREMENTS

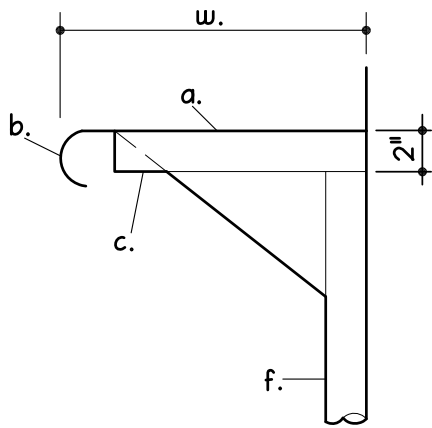
- a. FULLY WELD GUSSET TO FRAMEWORK OR SINK
- b. 3/4" MINIMUM CLEARANCE ALL AROUND
- c. SET SCREW NOT VISIBLE TO WORKING SIDE OF EQUIPMENT.
- d. MAXIMUM 1/32" CLEARANCE BETWEEN LEG AND FOOT
- e. FOOT SET AT MIDPOINT TO ALLOW 1" ADJUSTMENT UP AND 1" DOWN.
WITHOUT THREAD EXPOSURE.
- f. LEGS UNSUPPORTED 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.



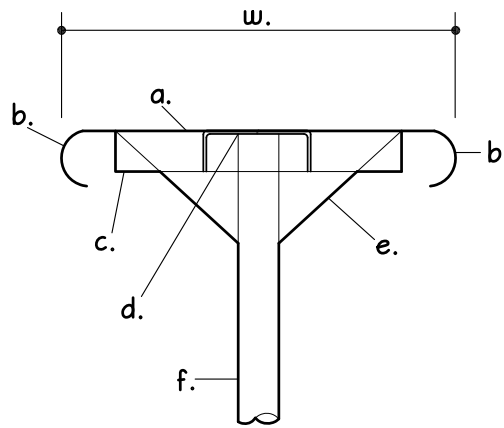
a. FULLY WELD, GRIND SMOOTH AND POLISH.



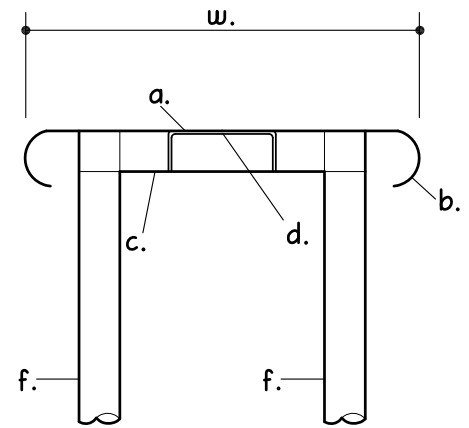
- a. FULLY WELD, GRIND SMOOTH AND POLISH.
- b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2".



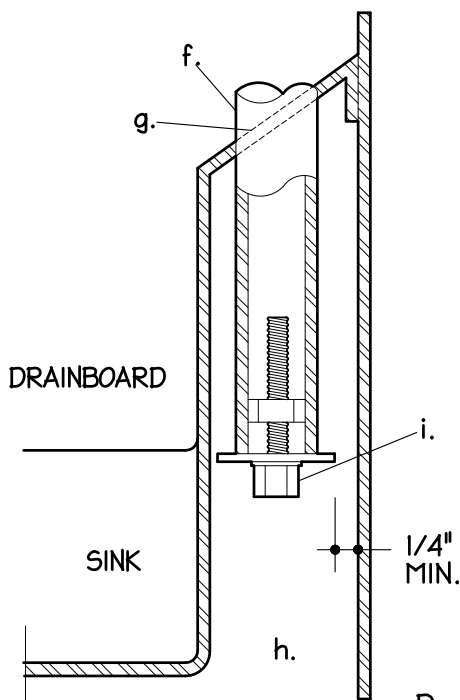
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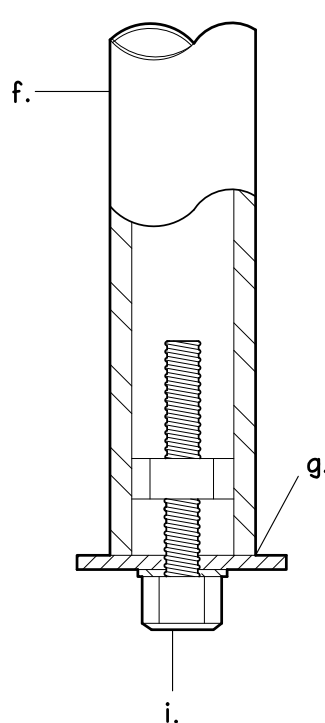
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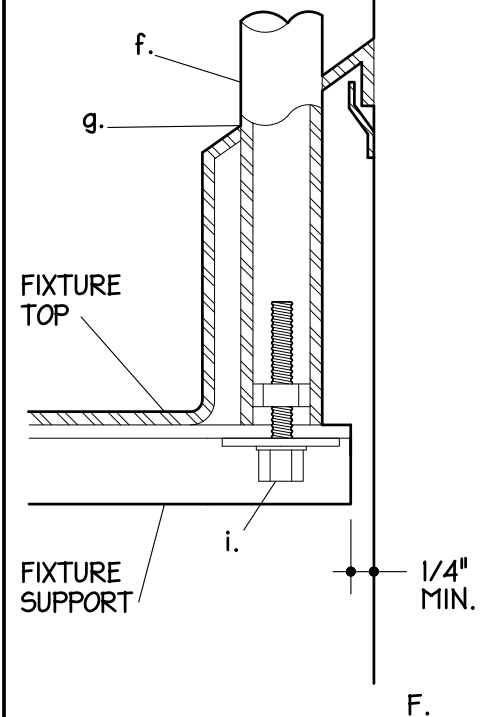
C.



D.

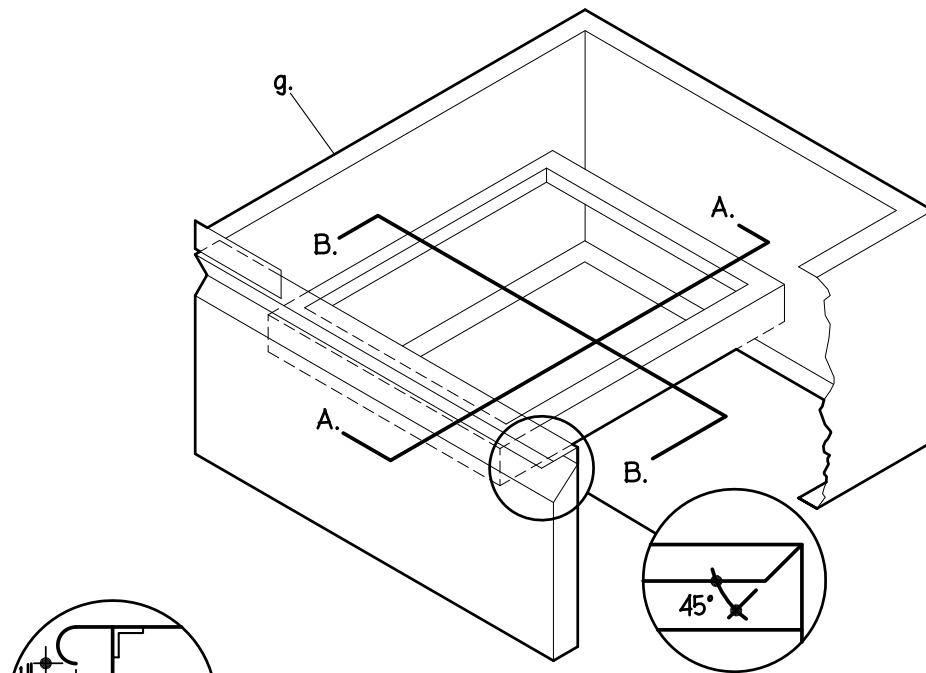


E.

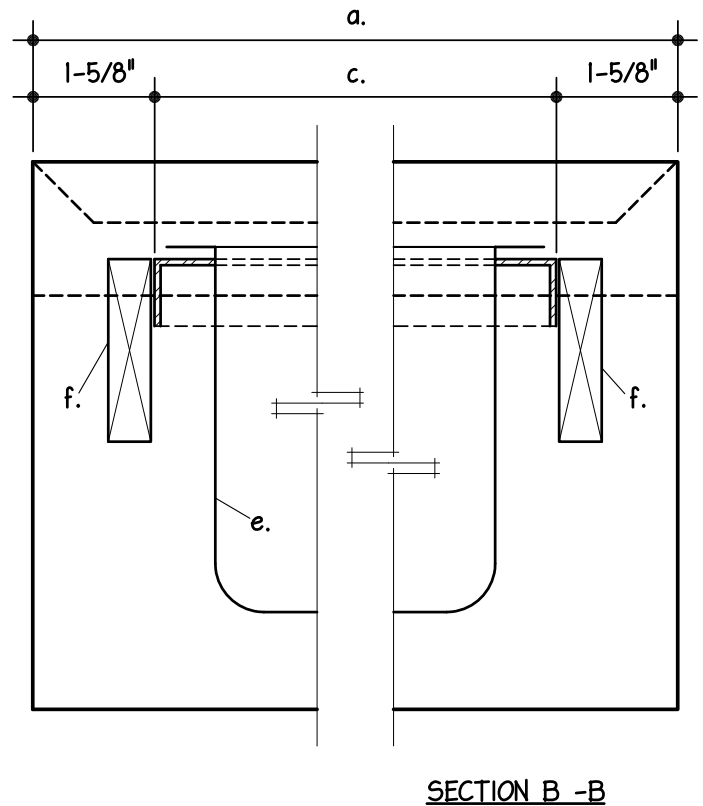
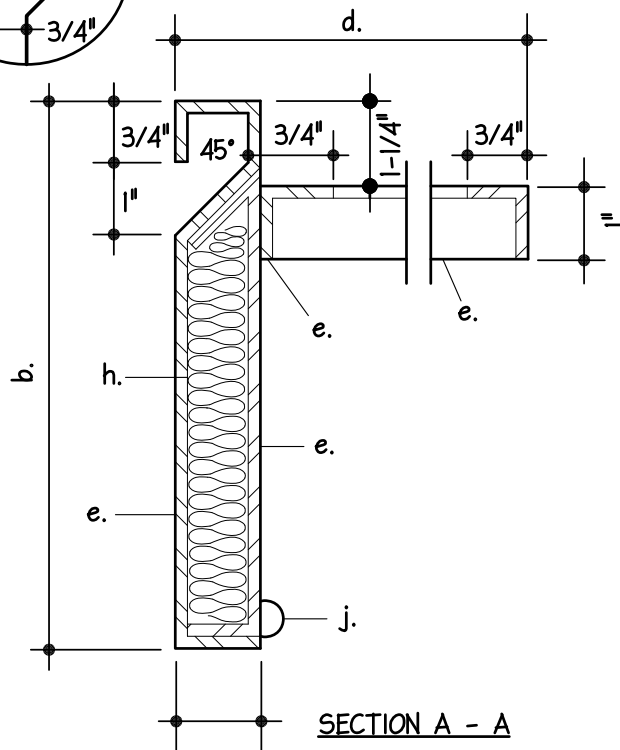
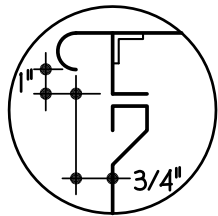


F.

- a. 16 GA S/S SHELF
- b. STD.- 1.02 EDGE
- c. 1"x 3"x 1" 14 GA. S/S CROSS CHANNEL
- 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.

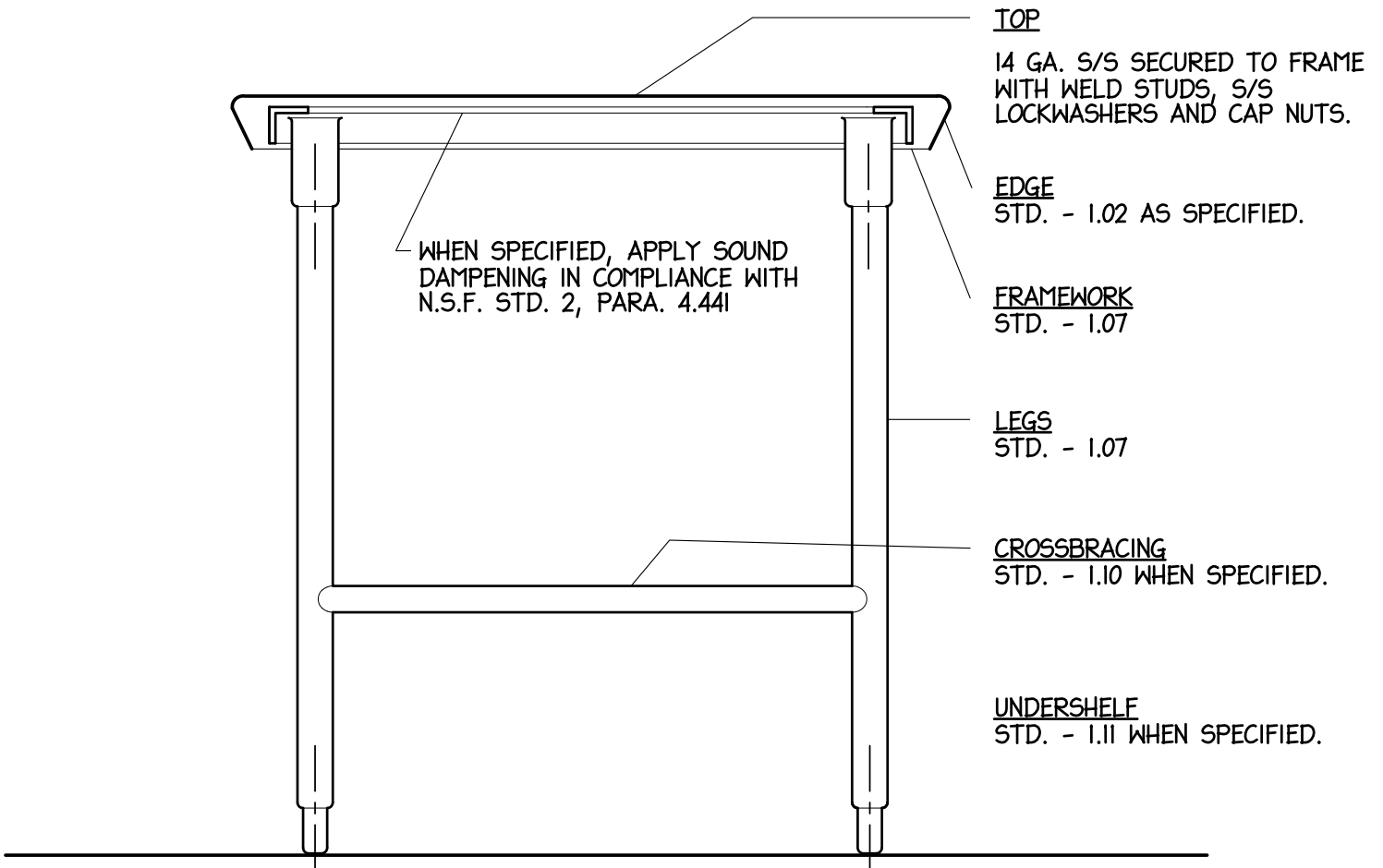
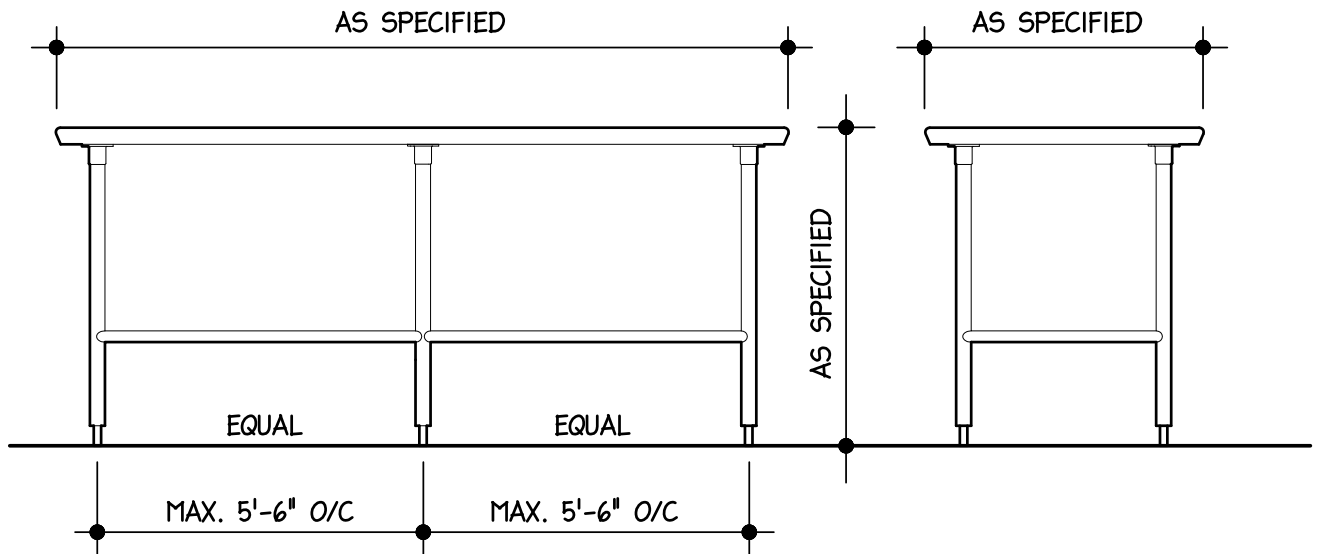


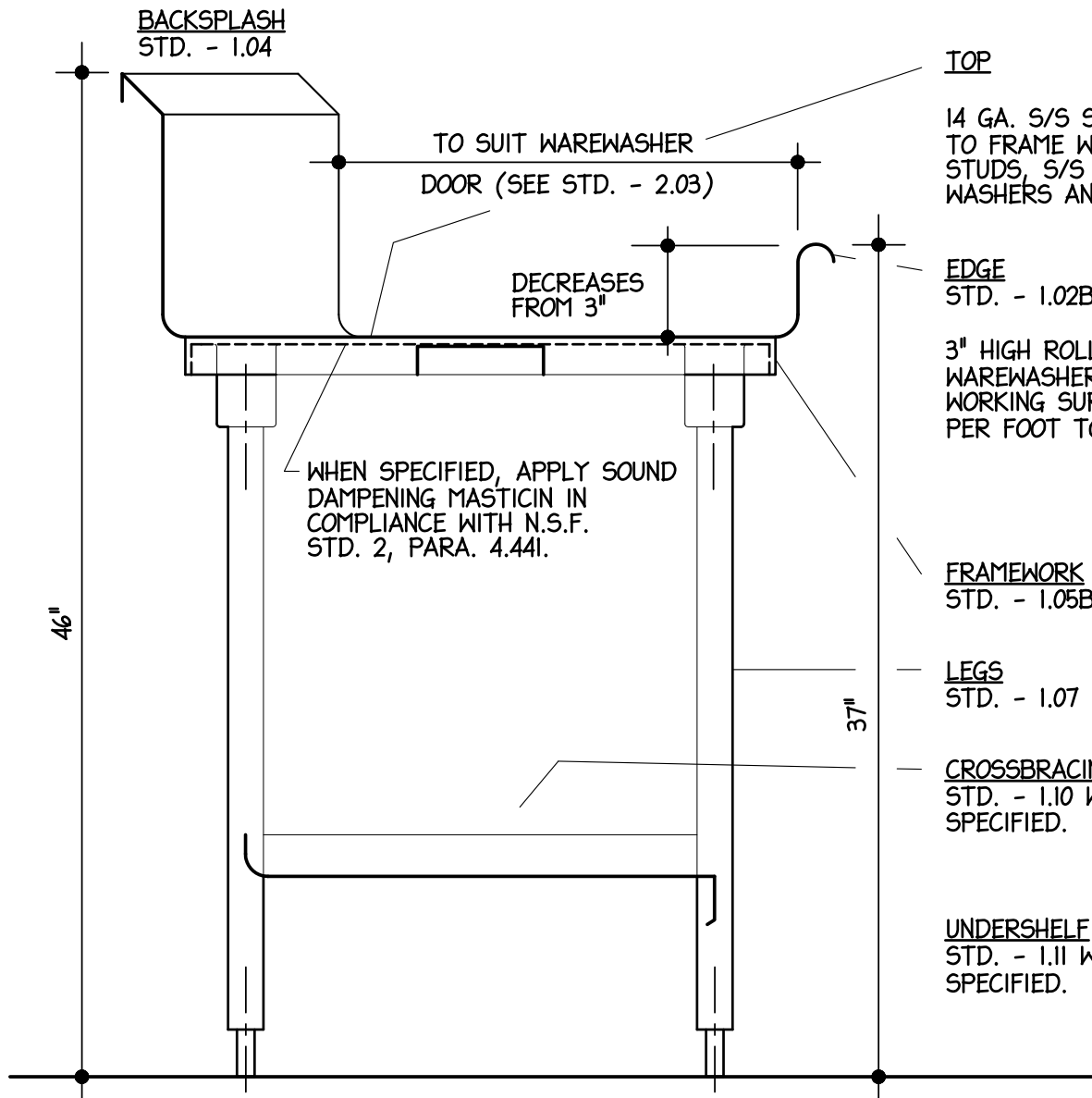
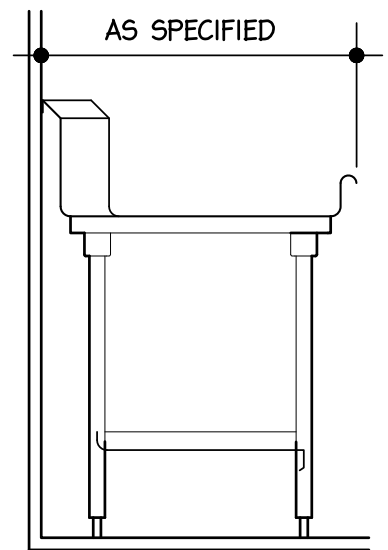
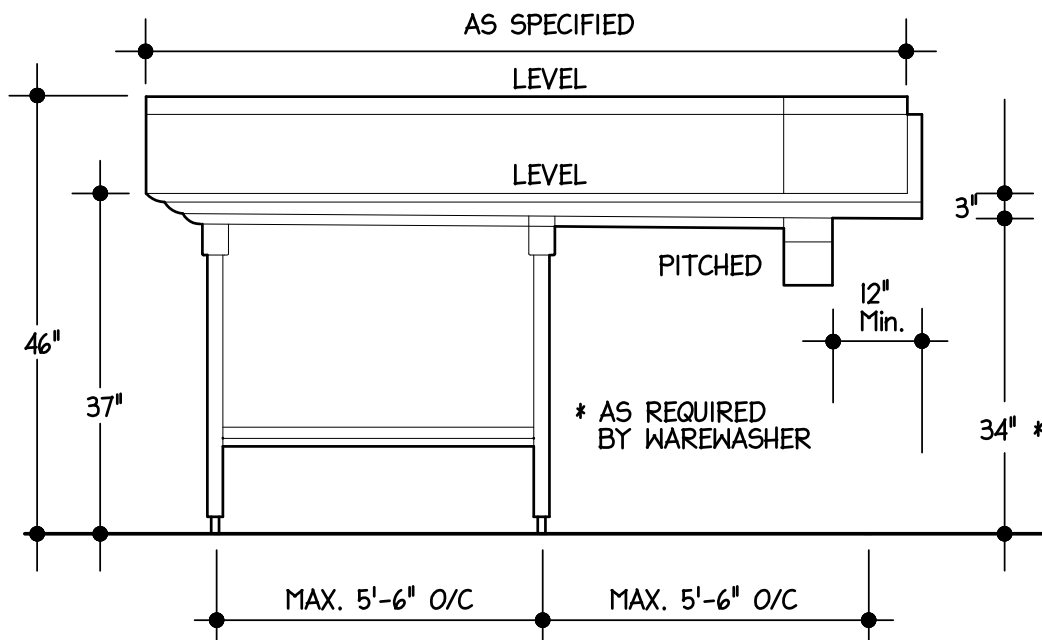
- e. 16 GA. S/S ALL WELDED.
- f. 3 PIECE SELF CLOSING DWR. SLIDE AS MFD. BY COMPONENT HARDWARE, S52 SERIES WITH S/S ROLLER BEARINGS. PITCH SLIDE DOWNWARD 3/8" PER FOOT FOR SELF-CLOSING ACTION.
- g. 18 GA. S/S DWR. ENCLOSURE. ALL WELDED.
- h. SEMI - RIGID FIBERGLASS SOUND DAMPENING.
- j. HARD RUBBER DRAWER 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

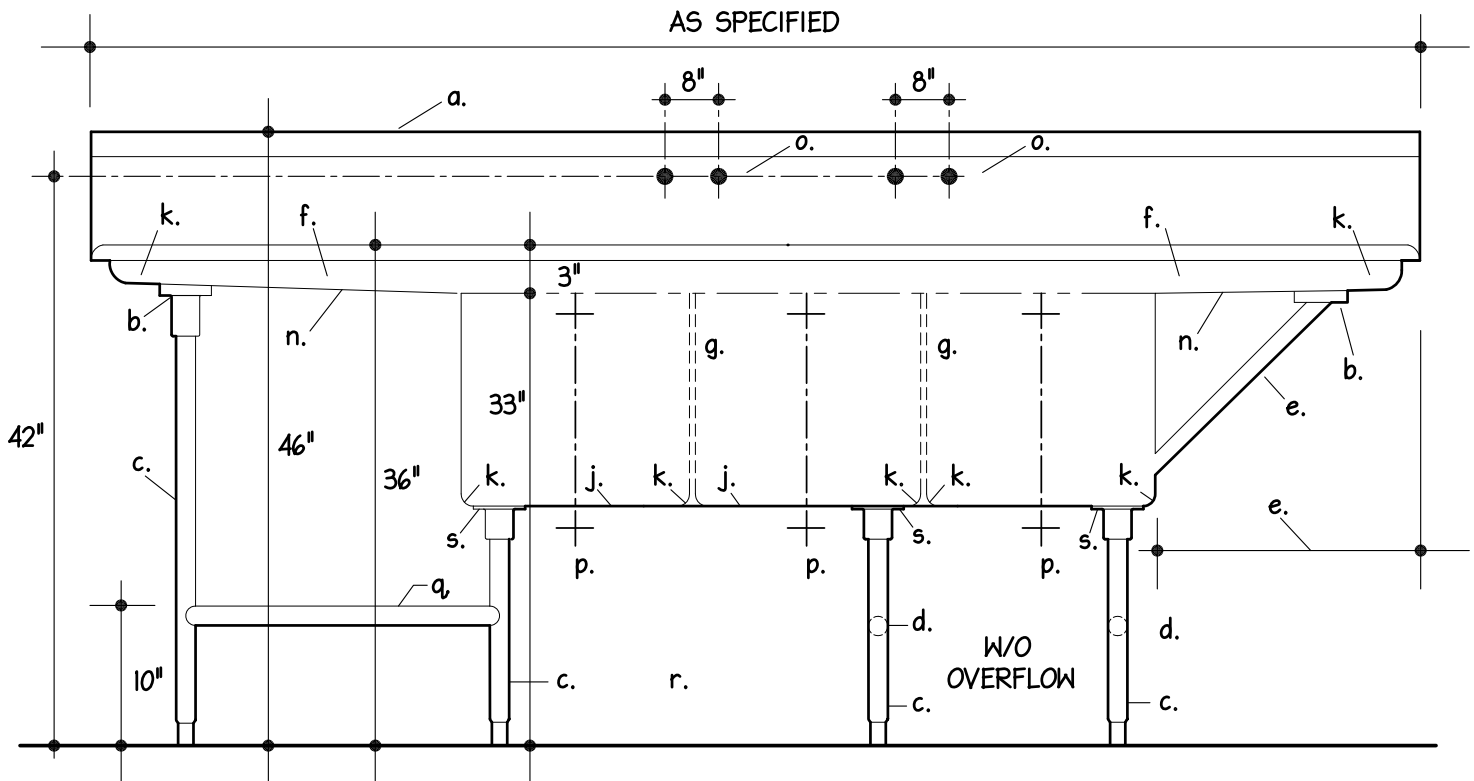
STD. - 1.07

CROSSBRACING

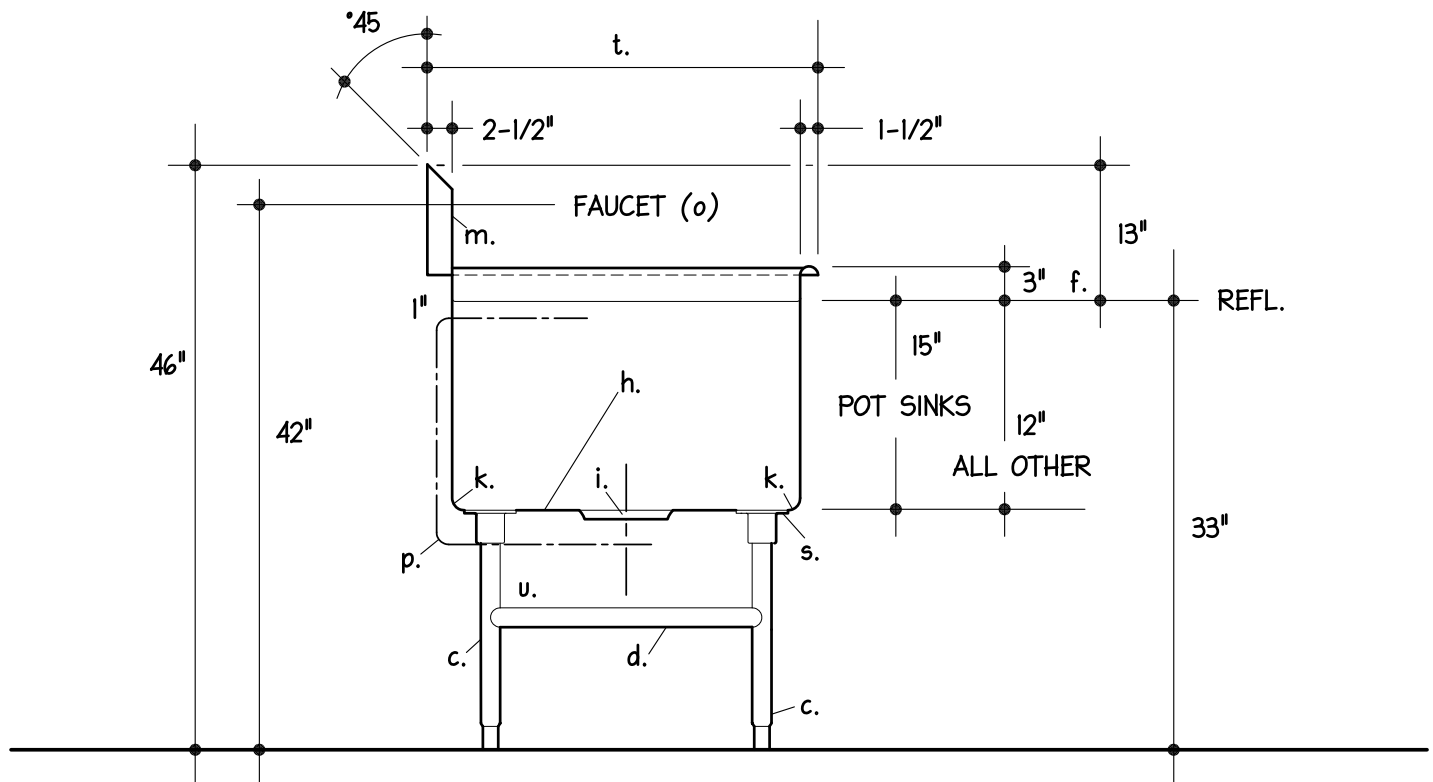
STD. - 1.10 WHEN
SPECIFIED.

UNDERSHELF

STD. - 1.11 WHEN
SPECIFIED.



ELEVATION



TYPICAL SECTION

a. MATERIAL - 14 GA. S/S.

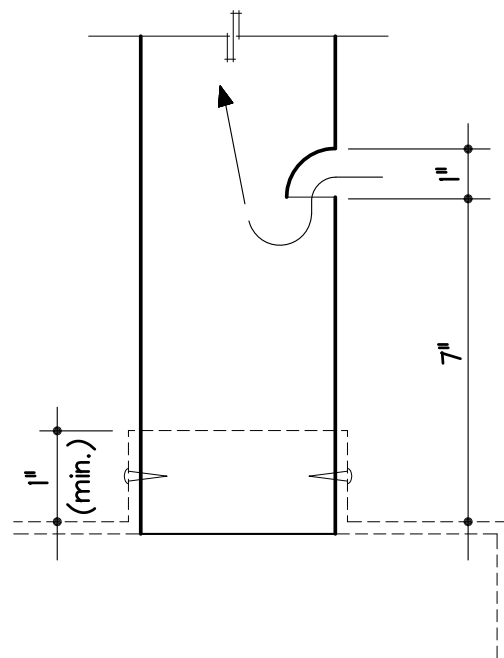
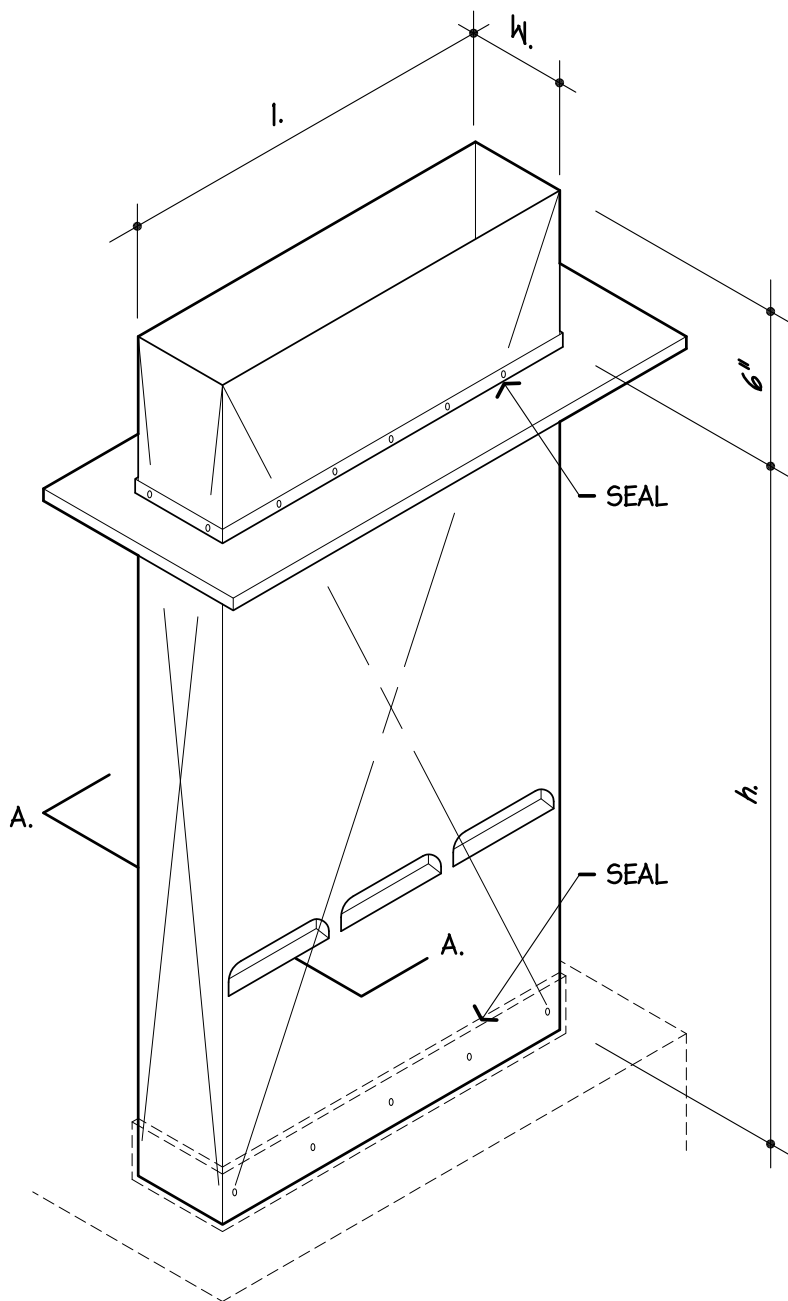
c. STD. - 1.07

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 51 23 - LIBRARY STACK SYSTEMS**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Modular wood library shelving system.

1.2 SUBMITTALS

- A. Product Data: For each type of library shelving system and accessory specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show plans, elevations, ends, cross-sections, and installation and anchorage details.
- C. Samples: Of each exposed product and for each color and finish required, 6 inches square.
- D. LEED Submittals: Comply with Section 018113.
 - 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 CoC.
 - 2. EQ Credit 2: Low-Emitting Materials
 - a. For composite wood installed within the building interior: Documentation indicating no added formaldehyde resins or compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM) for ultra-low-emitting formaldehyde (ULEF) resins.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide shelving and accessories manufactured by the same manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
- C. 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.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify library shelving system placement by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating shelving system without field measurements. Coordinate work of other contracts to ensure actual installation dimensions correspond to established dimensions.
- B. Space Enclosure and Environmental Limitations: Do not install library shelving until spaces are enclosed and weatherproof, wet-work in spaces is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.5 COORDINATION

- A. Coordinate layout and installation of shelving with work of other contracts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Drawings indicate the catalog numbers of library shelving units by manufacturer indicated, which are representative products used to establish a standard of design and quality required. Subject to compliance with requirements, provide Pin-Fast Wood & Steel Shelving; by The Worden Company, or a comparable product by one of the following:
1. Brodart Co.
 2. Library Bureau.
 3. Tesco Industries.
 4. Russwood Library Furniture.

2.2 WOOD LIBRARY SHELVING

- A. Wood Shelving: Modular type, with starter and adder units, 36 inches on center of uprights, complying with the following:
1. End Panels: 1-inch thick, 5-ply lumber core, exposed vertical edges banded with matching solid hardwood with square eased edges. Provide vertical rows of holes drilled near the front and rear of each panel for shelf adjustment on 1-inch centers. Attach tops and bases to end panels with 5/16-inch 18 x 3-inch hex-head bolts and washers. Do not use lag bolts or wood screws.
 2. Intermediate Uprights: 3/4-inch thick, solid maple hardwood glued up in flush panel design with square edges. Provide random width boards, no more than 4 inches or less than 1-inch. Stagger pin holes on both sides of panel to avoid coinciding with holes on opposite side. Drill panels through front and rear, top and bottom, for attachment of tops and bases with 5/16-inch 18 x 3-inch hex-head bolts, nuts and washers.
 3. Cornice Tops: 2-1/4-inch fascia, 3/4 inches thick of solid maple banded to 3/4-inch plywood panel. Provide 1/8-inch radius to top front corner of fascia. Butt a solid hardwood bolting cleat 2-1/4 by 1-1/4 inches glued and stapled to inside surface of top at each end.
 4. Base: 1/2-inch solid maple, 4 inches high. Provide a 2 by 3/4 inch rail tenoned full-length to the inside front. Provide bolting cleats 2-1/4 by 1-1/4 inches glued and stapled at ends of rail and drilled to allow assembly bolts to pass through. Provide second full-length rail at rear of bolting cleats for support and proper alignment.
 5. Shelves: 3/4-inch thick, solid hardwood with 2-inch nosing of solid maple. Provide random widths no more than 4 inches or less than 1-inch. Groove shelves 11/32 inches in diameter half round on underside of shelves to set firmly on 1-inch long, 5/16-inch diameter cadmium-plated and threaded shelf pins.
 6. Backs and Partitions: 1/4-inch plywood to match shelving. Provide backs finished on one side for single-faced shelving. Provide partitions finished on both sides for double-faced shelving. No added urea formaldehyde plywood.
- B. Wood Species and Cut for Exposed Surfaces: Clear maple, plain sliced.
- C. Composite wood installed within the building interior: Contain no added formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.

2.3 ACCESSORIES

- A. Shelf Label Holders: Plastic, for card size 5/8 by 5 inches.
- B. Special Shelves: Provide special shelving units for the following as required:
 - 1. Videos.
 - 2. Periodicals.
- C. Casters: Manufacturers heavy-duty casters.

2.4 FINISHES, GENERAL

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 WOOD FINISHES

- A. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards," Section 1500 requirements for factory finishing.
- B. Shop Finishing: Finish wood components at the fabrication shop. Defer final touchup, cleaning, and polishing until after installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for conditions affecting performance of library shelving system.
- B. Examine areas for suitable conditions where library shelving is to be anchored.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install library shelving system level, plumb, square, and true with integral adjustable leveling devices. Using shims shall not be permitted. Install to a tolerance of 1/8 inch in 96 inches for level and plumb shelves.
- B. Anchor single-faced ranges to wall construction by method recommended by manufacturer.

END OF SECTION

SECTION 11 52 13 - PROJECTION SCREENS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Front projection screen assemblies.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls and ceilings.
- B. Division 26 Sections for electrical service and connections including metal device boxes for switches and conduit, where required, for low-voltage wiring.

1.3 DEFINITIONS

- A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. Shop Drawings: Show layouts and types of projection screens. Include the following:
 - 1. Location of screen centerline relative to ends of screen case.
 - 2. Location of wiring connections.
 - 3. Location of seams in viewing surfaces.
 - 4. Drop length.
 - 5. Connections to supporting structure for pendant- and recess-mounted screens.
 - 6. Anchorage details.
 - 7. Details of juncture of exposed surfaces with adjacent finishes.
 - 8. Accessories.
 - 9. Wiring Diagrams: For electrically operated units.
- D. Samples: For case and frame finishes, submit two 2 by in size, illustrating color and texture of finish.
- E. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of projection screen through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver projection screens to project site in manufacturer's original unopened packaging. Inspect for damage and size before accepting delivery.
- B. Do not deliver projection screens until building is enclosed and other construction within spaces where screens will be installed is substantially complete and ready for screen installation.

1.7 COORDINATION

- A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling framing, light fixtures, HVAC equipment, and partitions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FRONT PROJECTION SCREENS

- A. Manufacturers:
 - 1. Bretford: www.bretford.com/#sle.
 - 2. Da-Lite Screen Company: www.da-lite.com/#sle.
 - 3. Draper, Inc: www.draperinc.com.
- B. Front Projection Screens: Factory assembled unless otherwise indicated.
 - 1. At Stage: Motorized, matte light diffusing fabric screen, , ceiling recessed with automatic ceiling closure.
 - a. Screen Viewing Area: NTSC Format (4:3) with minimum 200 inch diagonal.
 - b. Acceptable Product: Da-Lite - Model Boardroom Electrol; Draper - Model Envoy; or equal product by other listed manufacturer.
- 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. Mildew Resistance: Rating of 0 or 1 when tested according to ASTM G21.
 - 3. Flame Resistance: Passes NFPA 701.
 - 4. Seamless Construction: Provide screens, in sizes indicated, without seams.
 - 5. Drop Length: Provide extra drop length at top of screen to permit bottom edge of viewing surface to be lowered to with 12 inches of finished floor and views clear of obstructions.
 - 6. Edge Treatment: Black masking borders.
- D. Concealed-in-Ceiling Screen Cases: Metal or wood with metal lining; integral roller brackets.
 - 1. Door Slat: Self trim; self-closing and -opening.
 - 2. Case Finish: Baked enamel.
 - 3. Case Color: Factory primed for field painting to match bulkhead.
 - 4. End Caps: Steel; finished to match case.
 - 5. Provide screen case with trim flange to receive ceiling finish.
- E. Electrically-Operated Screens:

1. Roller: 3 inch aluminum, with locking device.
 2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.
 3. Horizontal Tensioning: Tab-guided cable system.
 4. Motor size and capacity as recommended by screen manufacturer.
 5. Permanently lubricated ball bearings.
 6. Preset limit switches to automatically stop screen in up and down positions.
- F. Provide mounting hardware, brackets, supports, controls, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.3 ELECTRICAL COMPONENTS

- A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.
- B. Motors: Direct drive, 110/120 V, 60 Hz.
1. Motor In Roller: Mounted inside roller; pre-wired; quick reverse type; equipped with thermal overload cut-off.
 - a. Motor mounted on vibration dampener.
 2. End Mounted Motor: Mounted at end of roller; pre-wired; quick reverse type; equipped with thermal overload cut-off.
 - a. Motor mounted on sound absorber.
- C. Controls: 3 position control switch with plate matching other electrical device cover plates in room where switch is installed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is finished and ready to accept screen installation.
- B. Verify that openings for recessed screens are correctly sized.
- 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 when screen is lowered.
- E. Install electrically operated screens ready for connection to power and control systems by others.

1. Install low-voltage controls according to NFPA 70 and manufacturer's written instructions.
 - a. Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 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. Verify that screen controls, limit switches, closure, and other operating components are in optimum functioning condition. Adjust as needed.
- 3.4 PROTECTION
- A. Protect installed products until completion of project.
 - B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11 61 43 - PLATFORM CURTAINS**PART 1 GENERAL****1.1 SUMMARY**

- A. Section includes curtains, track, carriers, pipe grid and accessories.
- B. Section includes the following types of Stage curtains.
 - 1. Front curtain.
 - 2. Teaser.
 - 3. Cyclorama.

1.2 DESIGN REQUIREMENTS

- A. Mill seconds and imperfect runs of mill seconds will be rejected.
- B. Fire Performance Characteristics:
 - 1. Supply fabric manufacturer's flameproof certificates at the time of invoice for all fabrics specified and selected; fabrics must be flameproof in accordance with requirements of state and local bureaus having jurisdiction.
 - 2. Provide curtains that are certified to be flame resistant according to requirements of NFPA 701; permanently attach label to each curtain indicating whether curtain is permanently and inherently flame resistant or whether it will require re-treatment after dry cleaning.
- C. Support Platform curtain items that are to be installed in a fixed position from a system of parallel pipe battens, and a single pipe batten shall correspond to each item, whether the item is a drapery that is tied directly to its corresponding pipe batten, or whether the item is a track that is located between the pipe batten and the drapery, or whether the item supported is some other piece of equipment; fasten hardware to the pipe battens by means of pipe clamps or trim chains.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate end track location, width of opening, location of blocking for anchors, appurtenances and interferences, adjacent construction, operating hardware, and support bracket details.
- B. Product Data: Submit track profiles, shapes, acceptable load data and finishes.
- C. Samples:
 - 1. Submit samples for initial selection purposes in form of fabric manufacturer's standard color card.
 - 2. Curtain and Lining Material: Minimum 36 x 36 inches of each color or pattern selected.
 - 3. Drapery Track: Minimum 18 inches long.
 - 4. Bottom and side hem intersection (include weights).
- D. Maintenance Data: Dry-cleaning or laundering instructions; include precautions in use of cleaning materials which may be detrimental to the surface if improperly applied.
- E. Surface Burning Characteristics: NFPA 701 small-scale vertical burn test.
- F. Certificates:
 - 1. Submit certification from a corporate officer of the manufacturer with the sample submissions.
 - 2. The certificate is required to include data and test ratings for physical properties specified.

3. Architect reserves the right to perform similar tests.

1.4 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications: Firm experienced in producing Platform curtains similar to those indicated for this Project that have a record of successful in-service performance with minimum five years experience.

1.5 PROJECT CONDITIONS

- A. Review the Drawings and Project Manual and visit the site before manufacturing, in order to field check conditions and to take accurate measurements; show recorded measurements on final shop drawings.
- B. Verify field measurements are as indicated on shop drawings.
- C. Supply and properly install equipment and miscellaneous items necessary for a proper installation of the Platform curtains at no additional charge.

PART 2 PRODUCTS

2.1 AVAILABLE MANUFACTURERS

- A. Track:
 1. Automatic Devices Company.
 2. J. R. Clancy, Inc.
 3. The Janson Industries.
- B. Fabric:
 1. Dazian, Inc.
 2. K-M Fabrics, Inc.
 3. Melfabco, Inc.
 4. The Janson Industries.

2.2 MATERIALS

- A. Velour (IFR):
 1. Material: 100 percent IFR Polyester Velour, 25-26 oz per linear yard.
 2. 54-inch minimum width.
 3. Not less than 40 backing ends per inch, 40 pile ends per inch and 32 picks per inch; 640 pile tufts per square inch.
 4. Fabric weighing not less than 23 ounces per linear yard, with one pile height of approximately 125 mils.
- B. Lining: IFR polyester lining, same fullness as main curtain.
- C. Repp Cloth:
 1. Rough-textured woven fabric with a finished appearance on both sides of cotton yarn.
 2. Inherently Flame Resistant.
 3. 54-inch minimum width.
 4. Fabric weighing not less than 13 ounces per linear yard.
- D. Steel Pipe: ASTM A53, Grade A, black, standard weight (Schedule 40), 1-1/2 inch nominal diameter, unless otherwise indicated.
- E. Supports, Clamps and Anchors: Sheet steel in manufacturer's standard gages; galvanized after fabrication.
- F. Support: Grade 30 Proof Coil.

G. Inserts, Bolts and Fasteners: Manufacturer's standard units.

2.3 FABRICATION - CURTAINS

A. Curtain Fabric:

1. Do not incorporate pierced horizontal or split width of materials in any part of the curtains.
2. Provide all fabrics of one color from one and the same dye lot; odd-and-end usage of color is not permitted.
3. Fabricate velour curtains with the nap down.

B. Lining:

1. Do not permit lining to hang loose from face material; attach to top of bottom hem of face material by tape 3/4 inch wide by 4 inches long.
2. Tape sections are to be located at each vertical seam across entire width of curtain sections.
3. Include integral shrinkage tuck of proper acceptable proportion.
4. Do not permit lining to prevent curtains from assuming soft and even folds and be in same fullness as face material.
5. Lining to be 2 inches shorter than face material.

C. Top Finish:

1. Fabrication to the specified dimensions with the specified fullness pleated to a 3-1/2 inch Inherently Fire Retardant reinforced nylon webbing.
2. Double-stitch IFR webbing to the top of the curtain with 1 inch of face fabric turned back under the webbing.
3. Insert heavy-duty grommets at each pleat with a tie line for fastening to battens.
4. Items so specified lined in same fullness as face material.
5. Supply track-mounted curtains with plated wire S-hooks.
6. Supply batten-mounted curtains with 36 inch braided #4 tie lines.
7. Pleats:
 - a. Provide fullness in curtains by sewing additional material into 6-inch double-stitched box pleats spaced at 10 inches to 12 inches on center along top hem reinforcing.
 - b. Provide not less than No. 2 brass grommets, centered on box pleats, for tie lines or S hooks.
 - c. Arrange vertical seams so they do not fall on faces of pleats.
8. Pleated-Fullness: Approximately 50 percent; curtain shall have 3 foot overlap.

D. Vertical Hems: Provide vertical hems not less than 2 inches wide, double-stitched and machine-sewn, with no selvage material visible from front of curtain; sew open ends of hems closed.

E. Turn Backs: Provide turn backs formed by folding 24 inches of face fabric back at each end of panels and securing by sewing across top hem and grommeting through both layers of fabric; do not sew turn back vertically.

F. Front Curtain Assembly:

1. The front curtain shall be 25-26 ounce IFR polyester velour with a IFR nylon lining.
2. Weight curtain at bottom with 1/2 ounce galvanized steel weights in a segmented supported vinyl weight pocket sewed inside bottom hem (9 weights per foot).

G. Teaser: Manufactured from same type material as main curtain; attach teaser to rear of Proscenium.

- H. Cyclorama: Standard 16 ounce black repp cloth.
- I. Colors: To be selected by Architect.

2.4 TRACK COMPONENTS

- A. Provide curtain tracks with the total number of carriers, head carriers, stop and all other items necessary to support the full weight of drapery material, and provide smooth operation and uniform appearance of curtains.
- B. Main Curtain:
 - 1. Project Standard: ADC 280 by Automatic Devices Company.
 - 2. Equip with standard end pulleys and continuous 3/8 inch diameter reinforced center, operating line with ball bearing carriers, and floor tension pulleys.
 - 3. Equip for bi-parting operation with center laps not less than 3 feet.
 - 4. Permanently surface-mounted floor pulleys.
- C. Cyclorama Curtain Track:
 - 1. Project Standard: ADC 142R with walk draw operation by Automatic Devices Company.
 - 2. Track may be curved at job site.
- D. Provide track products for front and back curtains with a 1-1/2 inch pipe backbone for additional support.
- E. Battens:
 - 1. Fabricate battens from black iron pipe (1-1/2 inch, Schedule 40) with minimum number of joints.
 - 2. As necessary for required lengths, connect pipe by means of drive fit pipe sleeve not less than 18 inches long and secure with four flush rivets, plug welds or other equally secure method.
 - 3. Shop-paint completed pipe battens with good quality primer.

PART 3 EXECUTION

3.1 PREPARATION

- A. Furnish layouts for inserts, clips or other supports required to be installed by other trades to support tracks and battens.

3.2 INSTALLATION

- A. Install materials according to manufacturer's printed instructions and recommendations.
- B. The Contractor is fully responsible for referring Platform equipment loads in this Section to the roof steel.
- C. Supply and install auxiliary angles for pipe as required between roof steel joists or beams.
- D. Where roof steel is exposed, track may be installed directly to the steel by means of clip angles to assure a level installation.
- E. Execute work using high standard of workmanship in fabrication and erection; the finished installation must be complete and functional in every respect with drapery trimmed, leveled and left ready for use.

3.3 INSTALLATION - BATTEN

- A. Install battens by suspending at proper heights with steel chains spaced at not more than 10 feet on center.

- B. Secure chains either directly to structures or to inserts, eye-screws or other devices that are secure and appropriate to substrate and that will not deteriorate or fail with age or elevated temperatures.

3.4 INSTALLATION - TRACK

- A. Stem-mounted Tracks: Drill track at intervals not greater than manufacturer's recommended spacing, and fasten directly to structural ceiling.
- B. Batten-hung Tracks: Install track by suspending from pipe batten with manufacturer's special pipe clamps at recommended spacing.
 - 1. Heavy-duty Track: Do not exceed 6 feet between supports.
 - 2. Curved Walk-along Track: Do not exceed 4 feet between supports, and provide additional supports at curves and splices.
- C. Install track for center-parting curtains with not less than a 3 foot overlap of track sections at center, supported by special lap clamps.

3.5 INSTALLATION - CURTAINS

- A. Furnish curtain sections for full length of all tracks and pipe battens unless noted otherwise.
- B. Install draperies after the floor has been finished and the building has been cleaned.
- C. Track-hung: Secure curtains to track carriers with track manufacturer's special heavy-duty S hooks or snap hooks.
- D. Batten-hung: Secure curtains to pipe battens with minimum 5/8 inch wide by 36 inch long braided soft cotton tie lines.

3.6 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Remove temporary bracing, scaffolding, etc., to permit full operation of and access to equipment.

3.7 DEMONSTRATION

- A. Completion Testing:
 - 1. Upon completing the Work of this Section, notify the Architect to schedule an inspection.
 - 2. Furnish sufficient workers to operate equipment and to perform such adjustments and tests as may be required.
- B. Instruct Owner-designated personnel on maintenance and operation of the systems.
- C. Special Testing: If laws, ordinances, or any public authority require the Work to be specially tested or approved, give the Architect timely notice of its readiness for inspection, and of dates of inspection to be made by other authorities.

END OF SECTION

SECTION 11 66 23 - GYMNASIUM EQUIPMENT**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following gymnasium equipment:
 - 1. Basketball equipment.
 - 2. Physical Education equipment.
 - 3. Safety pads.
 - 4. Floor sleeves for pipe standards.
- B. Related Sections include the following:
 - 1. Division 11 Section "Gymnasium Dividers."
 - 2. Division 26 Electrical.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and the following:
- C. Structural analysis data signed and sealed by the qualified professional engineer registered in the State of Maryland responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium equipment to structure.
- D. Samples for Initial Selection: For each type of gymnasium equipment indicated.
- E. Samples for Verification: For the following products:
 - 1. Pad Fabric: Not less than 3 inches square, with specified treatments applied. Mark face of material.
- F. Qualification Data: For Installer and professional engineer.
- G. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.5 COORDINATION

- A. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures including glass breakage.
 - 2. Warranty Period: Five years (unless otherwise specified) from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Performance Sports Systems.
- B. Porter Equipment Company.
- C. Draper.

2.2 MATERIALS

- A. Equipment Wall-Mounting Board: Wood, neutral-color painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- B. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

2.3 PHYSICAL EDUCATION EQUIPMENT

- A. Adjustable Chinning Bar:
 - 1. Basis-of-Design: Model No. 00197-100 by Porter, or equal by other named manufacturers.
 - 2. Bar shall be designed to provide eighteen (18) inches of adjustment in six (6) inch increments. Unit shall consist of a bar weldment and two (2) heavy, formed channels with wall mounting plates on both ends.
 - 3. The bar weldment shall consist of a 1" diameter solid bar 3'-6" in length, with formed braces to support the bar 1'-5" from the wall. The ends of the formed braces shall be designed to lock into holes on the wall mounted support channels to provide the adjustment capability. The lower ends of the formed brace supports shall be fitted with spring-loaded latch mechanisms to secure unit in place and provide quick and easy height adjustments. Bar may also be completely removed from the wall for storage when required. Hardware shall be provided to attach vertical channel assemblies to the wall.
 - 4. Finish of entire unit to be pit and peel resistant durable, gloss black powder coat.

2.4 BASKETBALL EQUIPMENT

- A. Ceiling Suspended Forward Fold Backstops:
 - 1. Basis-of-Design: Model No. 3107 "Single Post" ceiling suspended, forward fold, front braced backstop as manufactured by Performance Sports Systems, Noblesville, Indiana.
 - 2. "Single Post" vertical main mast assembly shall be constructed of 6-5/8" O.D. (.120" wall ASTM A-500 Grade B) structural steel tubing with diagonal side sway braces of 2 1/2" X 1 1/2" X14 gauge ASTM A-513 rectangular steel tube sway braces miter cut and welded in place to a top horizontal 4" x 1 1/2" x 0.18" web ASTM A-36 steel channel. Sway braces shall attach to mast above backboard for maximum rigidity. Mast and sway braces shall be welded for ceiling heights up to thirty (30) feet. Mast and sway braces

- shall be clamped for ceiling heights over thirty (30) feet (Model 3106). Backstop shall be front braced and fold forward. Front brace assembly shall have a fully adjustable folding knee joint allowing for exact playing position and maintenance free operation.
3. Goal shall be mounted directly through backboard into a heavy structural steel weldment which shall be clamped to vertical 6-5/8" O.D. center mast. (This direct attachment feature transfers the load on the goal directly to the mast pipe minimizing stress to glass backboard). Goal and backboard mounting design shall conform to NCAA, NFSHSA and FIBA regulations.
 4. The all-welded "Single Post" design shall be suspended from custom adjustable hangers with bronze bushings designed to be offset no less than 4" behind the center line of gravity of mast, providing for proper weighting of the assembly and insuring that unit locks securely and automatically into playing position.
 5. Backstop shall be supported from 3-1/2" O.D. pipe anchored to roof framing members by means of heavy formed steel support fittings. Superstructure pipes to be reinforced with special bridging or bracing when truss centers exceed spans of fourteen (14) feet. Each attachment clamp must be capable of supporting static loads of at least 10,000 lbs. with no deflection.
 6. All metal parts shall have factory applied powder coat finish in standard black. Available colors: white, blue, red, gray, and yellow.
 7. Folding Method: Electric Winch.
- B. Rectangular Glass Backboards:
1. Basis-of-Design: Model No. AFRG42 Aluminum Framed Rectangular Glass Backboard by Performance Sports Systems, Noblesville, IN.
 2. Backboards shall be 42 inches high by 72 inches wide.
 3. Backboard shall be manufactured from 1/2" tempered glass set in heavy extruded aluminum framing and cushioned by shock absorbing vinyl. Official border and target area permanently fired into glass.
 4. Goal mounting structure shall be a heavy welded formed steel assembly, and directly attached to lower horizontal frame member to minimize stress on glass.
 5. Backboard shall have limited lifetime warranty against defects in material and workmanship, and when used with Performance Sports System's Direct Goal Attachment feature shall be protected against shatter and breakage of glass. Board must meet NCAA, FIBA and NFSHSA specifications.
- C. Backboard Padding Kit:
1. Basis-of-Design: Model No. CE or NCE Adhered Backboard Padding by Performance Sports Systems, Noblesville, IN.
 2. Pad consists of two pieces with molded type square corners.
 3. Pads molded from Polyurethane Foam (minimum 9 pound density) with integral skin (self-skinning).
 4. Provide a glue or peel and stick tape type attachment.
 5. Pad meets all competition requirements of the NBA, NCAA, NFSHSA, and international requirements of FIBA.
 6. Color to be selected.
- D. Basketball Goal:
1. Basis-of-Design: Model No. 2000+ Breakaway Goal as manufactured by Performance Sports Systems, Noblesville, IN.
 2. Goal shall be fabricated from 5/8" diameter cold drawn alloy steel round formed to an 18" inside diameter ring. Inside of ring shall be positioned 6" from face of backboard by

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- heavy, formed steel hinged-type housing with removable cover to conceal mounting bolts and shock absorption mechanism of goal and to protect against finger entrapment.
3. Goal shall be designed to absorb shock loads from slam dunking or hanging on rim. Shock absorption feature shall be provided by means of a special offset hinge arrangement rim and back plate mounting housing with concealed molded rubber shock absorber.
 4. Goal shall meet NCAA, FIBA and NFSHSA specification on moveable rims, which states, "A moveable basket ring shall have rebound characteristics identical to those of a non-moveable ring." Goal shall be factory set to proper flex and rebound requirements.
 5. Goal shall be finished in durable, electrostatic powder coated official orange finish.
 6. Goal shall be furnished complete with heavy-duty white anti-whip nylon netting and mounting hardware.
- E. Electric Winch:
1. Basis-of-Design: Model No. 1194 Electric Backstop Winch by Performance Sports Systems, Noblesville, IN.
 2. Electric winch shall be a definite purpose electric winch designed specifically for use of basketball backstop positioning. Winch shall be worm gear type designed to hold backstop at any position during operation. Winch will be driven by a 3/4 HP, 120-volt, 60 hertz, single-phase instant reversing electric motor with thermal overload protection (governed to stall at 14 amps to prevent overload) and manufactured to NEMA specifications. Winch shall develop over 1000 lbs. of line pull at a speed of nine (9) feet per minute.
 3. Winch shall have high-speed worm gearing to support both radial and thrust loads, and positive locking double reduction gear drive providing 200:1 reduction rate for strong cable hold under load, eliminating need for special brakes. Sealed gear case for lifetime maintenance free operation.
 4. Winch shall incorporate a large 4-1/2" diameter grooved drum to assure long cable life and proper coiling, with a tension roller for correct cable tracking even in slack conditions. Drum shall be grooved for 1/4" 7 x 19 galvanized aircraft cable to facilitate smooth take-up and proper spooling of cable. Drum shall allow 25 feet of travel on one (1) layer and 40 feet on two (2) layers.
 5. Operation:
 - a. Winch shall utilize a flush mounted single keyed switch to both raise and lower backstop. Key switch shall be located so that the backstop is in full view of authorized operator at all times.
 6. Winch shall have five (5) year warranty against material defects and workmanship. Winches with less than a five (5) year warranty shall not be considered equal.
- F. Backstop Auto Lock Safety Strap:
1. Basis-of-Design: Model No. 1100 Safstop safety strap by Performance Sports Systems, Noblesville, IN.
 2. Provide one for each backstop.
 3. Safety strap shall be inertia sensitive to automatically lock basketball backstop in position at any time (in storage or during raising or lowering cycle) due to any sudden surge of speed created by possible malfunction(s) of hoisting apparatus, winch, cable, pulleys, support fittings, etc.
 4. Safety strap shall incorporate a two (2) inch wide nylon belt rated at 6,000 lbs. breaking strength. Entire unit to be tested to withstand 1,500 lb. free fall load and rated at 1000 lbs. Strap shall extend a maximum of 35'-0" and shall be automatically retracted and stored on
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- a reel equipped with a special negator type constant force spring. Operation and locking action of strap shall be set by inertial force for immediate and positive setting, or centrifugal force to instantly lock basketball backstop before unit can gain momentum. Unit shall incorporate a fully automatic reset requiring no poles, ropes, levers or buttons.
5. Safety strap shall be furnished with universal mounting bracket to fit 3-1/2" O.D. pipe mounted either parallel or at right angles to backboard. Belt shall be supplied with an auto-lock belt clamp for ease of securing directly to basketball backstop.
- G. Manual Basketball Backstop Height Adjuster:
1. Basis-of-Design: Model No. 1130 Manual Adjust-A-Goal by Performance Sports Systems, Noblesville, IN.
 2. Height adjuster shall be manufactured of steel using an Acme threaded screw rod with awning type hand crank to raise and lower backboard. Height adjuster shall be screw driven to raise and lower goal height from 8' to 10' off of finished floor. Screw drive shall be a 3/4" Acme double-start threaded rod secured in two bronze bushings. Height adjuster shall be operated from floor by hand crank (included with height adjuster). Height adjuster to mount directly to goal attachment to transfer load of play directly through backboard to support structure.

2.5 SAFETY PADS

- A. Basis-of-Design; Model No. 4120 Wall Padding as manufactured by Performance Sports Systems, Noblesville, IN.
1. Panels 2 feet wide x 6 feet high.
 2. Construct panels of 6 pound density bonded urethane foam filler cemented to 7/16 inch OSB backing board and covered with 14 ounce vinyl laminated material which shall be mildew and rot-resistant, and fortified with an infection combating fungicide and shall be stapled securely to back of plywood; cover material tear strength of 100 psi.
 - a. No added urea formaldehyde for plywood and laminating adhesive.
 3. Provide 1 inch nailing margin at top and bottom.
 4. Cutouts in panels shall be made in field to fit job conditions.
 5. Color: As selected by Architect from manufacturers full range of colors.

2.6 FLOOR SLEEVES FOR PIPE STANDARDS

- A. Floor Sleeves with Chrome Covers: Senoh Floor Plate and Sleeve KA25 (for Volleyball) and KA45 (for Badminton). Provide coverplates from Senoh to coordinate with floor plates.
- B. Cover plate consists of molded plastic recessed mounting flange, cork gasket and a 5-inch diameter chrome plated cover.
- C. Cover shall be equipped with a swivel type retainer pin to prevent theft.
- D. Special key shall be provided for cover removal.
- E. Sleeve shall be 3-3/4 inch O.D. heavy wall steel tubing extending 9 inches into concrete footing.
- F. Bottom of sleeve to be capped with a 4-inch square anchor plate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances and other conditions affecting performance.

1. Verify critical dimensions.
2. Examine supporting structure.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
 1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Wall Safety Pads: Mount with bottom edge at 4 inches above finished floor.
- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 11 66 43 - BASKETBALL SCOREBOARD**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Single-sided LED basketball scoreboard.
- B. Related Sections include the following:
 - 1. Division 11 Section "Basketball Shot Timer Scoreboard."

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's product illustrations, data, and literature that fully describe the scoreboards and accessories proposed for installation.
- B. Shop Drawings: Show installation details including wiring diagrams.
- C. Operation and Maintenance Data: To include in operation and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Submittals."
- D. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of scoring equipment specified in this section and other sections through one source from a single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- C. Regulatory Requirements: Fabricate and label shot timer scoreboard to comply with the following:
 - 1. ETL listed to UL Standards 48 and 1433.
 - 2. NEC compliant.
 - 3. FCC compliant.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store scoreboard and equipment in a clean, dry environment.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.
- B. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
- C. Supply weight and mounting method to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of shot timer scoreboards that fail in materials or workmanship within specified warranty period.
 - 1. Faulty operation of equipment.
 - 2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- B. Warranty Period: 5 years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

- A. Provide an exchange program to supply replacement parts for components that fail during the coverage period. To minimize downtime, the exchange parts shall be shipped on the same day the order is received or on the following day. The manufacturer will also enclose an air bill for return of the defective components.
- B. Provide access to a local authorized service company.
- C. Provide a help desk staffed by experience technicians and coordinators who are thoroughly familiar with the scoreboard and available for technical support. The staff must be available at no additional cost to the customer and provide an "on-call" service during weekends.

PART 2 PRODUCTS

2.1 SCOREBOARD

- A. Basis-of-Design Product: The design for scoreboard is based on Daktronics, Inc.; BB-2101-13.
- B. Provide the basis-of-design, or comparable models from one of the following acceptable manufacturers:
 - 1. Nevco.
 - 2. Sportable Scoreboards.
- C. General: Single-sided basketball scoreboard that also scores volleyball and wrestling. It scores HOME and GUEST to 199, PERIOD to nine, indicates possession and bonus, displays period time to 99:59 and during the last minute of the period, it displays time to 1/10 of a second.
 - 1. Dimensions: 4'-0" high, 8'-0" wide, 0'-6" deep.
 - 2. Weight: 120 lbs.
 - 3. Power Requirements: 200 W.
 - 4. Color: To be selected by Architect from minimum 100 colors.
- D. Construction: Aluminum cabinet capable of withstanding high-velocity impact from indoor sports balls without the need for protective screens, as follows:
 - 1. Face and Perimeter: 0.063 inch thick.
 - 2. Back: 0.050 inch thick.
 - 3. Digit Faceplates: 0.063 inch thick.
- E. Digits:
 - 1. AS AlInGaP LED digits.
 - 2. Seven bar segments per digit.
 - 3. LED Digit Technology: A diffusant over the LEDs blends the light achieving a uniform look with 140 degree maximum viewing angle.
 - 4. Clock and Score Digits: 13 inches high.
 - 5. PERIOD and time outs left digits: 10 inches high.

6. Clock, Colon, PERIOD Digits and Bonus Indicators: Amber LEDs.
7. Score Digits and Possession Indicators: Red LEDs.

F. Captions:

1. HOME and GUEST Captions: 6 inches high.
2. PERIOD Caption: 4 inches high.
3. All Captions: White vinyl applied directly to scoreboard face.

G. Horn:

1. Vibrating Horn: Mounts behind scoreboard face.
2. Sounds automatically when shot clock counts down to zero.
3. Sounds manually as directed by operator.

H. Power Cord:

1. Cord is 11 feet long.
2. Cord plugs into a standard grounded 120 V AC outlet.

2.2 SCORING CONSOLE

- A. Basis-of-Design Product: The design for shot timer scoreboard is based on Daktronics, Inc.; All Sport 3100.
- B. Capable of scoring basketball, volleyball, and wrestling through the use of keyboard inserts.
- C. Capable of controlling other scoreboards.
- D. Console has a maximum power requirement of 5 watts.
- E. Console recalls clock, score, and period information if power is lost.
- F. Console Include:
 1. Aluminum enclosure to house electronics.
 2. Sealed membrane water-resistant keyboard.
 3. 32-character liquid crystal prompting display to verify entries and recall information currently displayed.
 4. 6-foot-long power cord to plug into a standard grounded 120 VAC outlet.
 5. Practice timer mode:
 - a. Can sound horn at the end of each segment.
 - b. Has 99 programmable segments.
 - c. Displays the segment number and segment length.
 - d. Has a programmable interval time.
 6. Portable signal kit.
 7. 2.4 GHz spread spectrum radio for scoreboard control.
 8. Battery pack.

2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for, installation tolerances, and other conditions affecting performance of work.
 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide conduit cables and outlet boxes.

3.3 INSTALLATION

- A. Mount scoreboards in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.
- B. Test the operation of the scoreboard and controller; leave control unit in carrying case and other loose items with Owner.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain shot timer scoreboards. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 11 66 53 - GYMNASIUM DIVIDER**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes gymnasium divider curtain.
- B. Related Sections include the following:
 - 1. Division 26 Sections for electrical service for motor operators, controls, and other powered devices for motorized gymnasium divider.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium dividers to structure.
- D. Samples for Initial Selection: For each type of gymnasium divider curtain fabric indicated.
- E. Samples for Verification: For divider curtain fabric, not less than 12 inches square of open mesh, and of opaque fabric.
- F. Product Certificates: For each type of gymnasium divider, signed by product manufacturer.
- G. Qualification Data: For installer and professional engineer.
- H. Operation and Maintenance Data: For gymnasium dividers to include in emergency, operation, and maintenance manuals.
- I. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of gymnasium divider from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium divider until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position for gymnasium divider.

1.5 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium divider and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium divider that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, faulty operation of gymnasium dividers.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
 - 2. Cast Aluminum: ASTM B 179.
 - 3. Flat Sheet: ASTM B 209.
- B. Steel: Comply with the following:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36.
 - 2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
 - 3. Steel Sheet: ASTM A 1011.
- C. Support Cable: Manufacturer's standard galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.
- D. Support Chain and Fittings: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized steel connectors and hangars.
- E. Castings and Hangers: Malleable iron, ASTM A 47, grade required for structural loading.
- F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

2.2 DIVIDER CURTAIN

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Draper Inc.
 - 2. Jaypro Sports, LLC.
 - 3. Performance Sports Systems.
 - 4. Porter Athletic.
- B. Divider Curtain: Electrically operated, folding, and as follows:
 - 1. Upper Curtain, Mesh: Woven fabric of 100 percent polyester yarn coated with PVC weighing not less than 6.5 oz./sq. yd.
 - a. Mesh Color: White.
 - 2. Lower Curtain, Solid: Woven polyester coated with PVC, minimum 18 oz./sq. yd, embossed, 8-foot height above floor.
 - a. Fabric Color: As selected by Architect from manufacturer's full range.
- C. Curtain Fabrication: Fused seams and the following:
 - 1. Top Hem: Reinforce with double thickness mesh for grommets and continuous pipe batten.

D. Accessories:

1. Grommets: Manufacturer's standard size and spacing, for snaps or S-hooks.
2. Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413.
3. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with drive-fit pipe sleeve not less than 18 inches long, and secure with 4 flush rivets, plug welds, threaded couplings, or another equally secure method. Shop-paint completed pipe battens with black paint.
 - a. Steel Pipe: ASTM A 53, Grade A, standard weight (Schedule 40), black, 1-1/2-inch nominal diameter, unless otherwise indicated.

E. Divider Curtain Operator: Belt Drive.**F. Divider Curtain Electric Operator:** Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.

1. Operator Type: Electric motor, enclosed gear-head-reduction drive, with chain and sprocket secondary drive.

G. Motor Characteristics: Sufficient to start, accelerate, reverse, and operate connected loads at designated speeds within installed environment and with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1, and the following:

1. Voltage: Coordinate with Electrical Construction Documents.
2. Horsepower: 3/4 hp.
3. Enclosure: Manufacturer's standard.
4. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
5. Remote-Control Station: Key pad control system; NEMA ICS 6, Type 1 enclosure for recessed or flush mounting.

PART 3 EXECUTION**3.1 EXAMINATION****A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.**

1. Verify critical dimensions.
2. Examine supporting structure.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General:** Comply with manufacturer's written installation instructions. Complete field assembly, where required.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, have been completed.**

C. Gymnasium Divider and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.

1. Verify clearances for movable components of gymnasium divider throughout entire range of operation and for access to operating components.

D. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

A. Adjust movable components of gymnasium divider to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium divider. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 11 67 33 - MODULAR CLIMBING WALLS**PART 1 - GENERAL****1.1 SUMMARY**

- A. This section includes traverse modular climbing wall systems.

1.2 REFERENCES

- A. CEN/AFNOR - Standards for Artificial Climbing Walls
- B. Uniform Building Code (UBC) - 1994 Edition
- C. Manual of Steel Construction, Allowable Stress Design, 9th Edition, AISC

1.3 SYSTEM DESCRIPTION

- A. Modular artificial climbing wall designed and installed to CEN/AFNOR Standards, manufactured off site.

1.4 QUALITY ASSURANCE

- A. Panel manufacturer shall be as specified and have a minimum of 10 years experience in the manufacturing of artificial climbing walls. No substitutions will be permitted.
- B. Fabricator / Installer shall be acceptable to the panel manufacturer.
- C. Installer shall have a minimum of two years experience with manufacturer's materials or be supervised by manufacturer's representative.
- D. Pre-Installation conference: Conduct conference at project site to comply with requirements of Division 1.
- E. Representative of manufacturer must be on site for first day of installation and last day of installation; and additional site visit must occur between start and finish.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specifications
- B. Product data including panel manufacturer's specifications, standard details, and installation drawings.
- C. Submit 1 sample at least 6 inches by 6 inches, showing color and finish.
- D. Shop drawings indicating layout of panels, dimensions of materials and parts, fastening and anchoring methods, and detail and location of joints.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect products during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Protect panel finish and edges in accordance with manufacturer's recommendations.
- C. Store panels in accordance with manufacturer's recommendations.

1.7 WARRANTY

- A. Panel manufacturer shall warrant to the original purchaser for one year from the date of substantial completion that its products are free from defects in material and workmanship.

1.8 COORDINATION

- A. Coordinate installation of primary support structure, climbing wall panels, and any other final details before final finishes to climbing wall area have been performed.

1.9 PROJECT CONDITIONS

- A. Building shall be enclosed and capable of maintaining a minimum temperature of 55 degrees F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Pyramide USA, P.O. Box 530 Frederick, MD 21705 Office 800-736-2873, Fax (800) 736-2873.
- B. Other Acceptable Product: Traverse Walls, by Everlast Climbing Industries.

2.2 ARTIFICIAL CLIMBING WALL MATERIALS

- A. Basis-of-Design:
 - 1. Traverse Wall System by Pyramide.

2.3 TRAVERSE WALL SYSTEM

- A. Panels : 4x8x3/4" minimum B/C grade or better; provide 10 panels; 15 climbing holds per panel.
- B. Framing: 2x4 framing around perimeter of each panel, and 1 vertical in center of each panel
- C. T-nuts: minimum 72 3/8 16 x 7/16 4 prong zinc plated t nuts per panel
- D. Holds: minimum 15 urethane climbing holds per traverse wall panel, no polyester resin holds will be allowed.
- E. Texture: Panels will be coated with a texture paint to match vertical climbing wall colors
- F. Mats: Class A - 4 feet wide x 6 feet tall minimum 2.5" thick climbing wall pad, pad must attach to base of wall, as well as have security straps at the top to secure mats vertically against traverse wall panels when wall is not in use; provide mats in a quantity to protect full length of climbing wall.
- G. System Length: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION INSPECTION

- A. Verify that all surfaces are ready to receive work and are within specified tolerances.
- B. Beginning of installation means installer accepts conditions of existing surfaces.
- C. Verify that layout of the materials or equipment will not interfere with installed climbing wall.

3.2 INSTALLATION

- A. Erection of the climbing wall system shall be in accordance with manufacturer's recommendations.
- B. Erection shall be accomplished by a fully trained, factory authorized erector.
- C. Complete wall shall comply with specified tolerances and shop drawing requirements.

3.3 TOLERANCES

A. Panel Tolerances:

1. Panel bow: max 0.8% of panel dimension in width and length.
2. Panel dimensions: All panel dimensions shall be $\pm 1/8"$ of dimensions show on shop drawings.
3. Panel edges shall be sharp, true and vary less than $1/16"$ from a straight line.
4. Panels may show non-structural micro surface cracks, not greater than $1/32"$.

3.4 CLEAN-UP

- #### A. Clean area of debris from installation of climbing panels.

3.5 INSPECTION

- A. The completed climbing wall shall undergo a full complete final inspection by a duly trained representative of the manufacturer and shall be certified by the manufacturer that the finished product has been manufactured and erected in accordance with the manufacturer's approved installation drawings and these contract documents.
- B. The completed climbing wall shall undergo a full and complete final inspection by the Owner or Contractor

3.6 PROTECTION

- #### A. Protect climbing wall from damage during erection and ensure that the climbing wall will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 12 24 13 - WINDOW SHADE SYSTEMS**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes room darkening roller shades and motorized shade operators.
 - 1. Location of manual or electrical shades as indicated on Drawings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
 - 1. Motorized Shade Operators: Include operating instructions.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
 - 1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 - 2. Wiring Diagrams: Power, system, and control wiring.
- C. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 3 inches square, with specified treatments applied. Mark face of material.
 - b. Fascia: Full-size unit, not less than 12 inches long.
 - c. Complete parts box containing motorized shade hardware.
- E. Product Certificates: For each type of roller shade, signed by product manufacturer.
- F. Qualification Data: For Installer.
- G. Product Test Reports: For each type of roller shade.
- H. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content shades: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For shades, if applicable: Material Ingredient Report and optimization report.
- I. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.
 - 4. Motorized shade operator.

1.3 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Source Limitations:**
 - 1. Obtain roller shades through one source from a single manufacturer.
 - 2. To control the responsibility for performance of motorized roller shade systems, assign the design, engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and their authorized installer/dealer. The Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer:
 - a. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the Electrical Drawings.
 - b. Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
 - c. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.
 - d. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/ control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
 - e. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.
- C. **Fire-Test-Response Characteristics:** Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. **Flame-Resistance Ratings:** Passes NFPA 701.
- D. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. **Product Standard:** Provide roller shades complying with WCMA A 100.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver shades in factory packages,** marked with manufacturer and product name and location of installation.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Store, handle, protect and install absorptive materials, including fabrics materials, in accordance with the Construction IAQ Management Plan required by Division 1 specifications.
- C. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

- A. Motorized Components (exclusive of shade motors and motor logic control systems and components): Twenty-five Years Fit for (intended) use per published terms and conditions, from the Date of Substantial Completion and contain provisions that installation is to remain operational without fault for the warranty period; and, include all operating parts, including shade band.
- B. Shade motors and motor logic control systems: Five years from Date of Substantial Completion for shade motors and motor logic control systems and components. Motorized shade installation will remain operational without fault for the warranty period and include all operational parts.
- C. Installation: Provide roller shade installer's warranty that installation shall be free of defects for a period of not less than 1 year.
- D. In the event of a warranted product failure, the roller shade installer will, at no cost to Owner, facilitate acquisition and delivery of all necessary components to the Owner. Owner will provide roller shade dealer/installer with direct access to the work, during dealer/installer's normal business hours.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed, or portion thereof.
 - 2. Shade Motors: 5 additional.

PART 2 PRODUCTS

2.1 ROLLER SHADES

- A. Basis-of-Design Products:
 - 1. Vertical Shades: Subject to compliance with requirements, provide MechoShade and ElectroShade by MechoShade Systems or equivalent products by Solarfactive/Accent Architectural or Lutron.
- B. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
2. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
- C. Access and Material Requirements:
 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.
- D. Shade Brackets: Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
- E. Motorized Shade Hardware and Shade Brackets:
 1. Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
 2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 3. Basis-of-Design: ElectroShade II; six-sided box units for recessed installation with bottom slot opening.
- F. Manual Shade Bracket: Mecho/5.
- G. Fascia: Provide where indicated on Drawings.
 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
 2. Fascia shall be able to be installed across two or more shade bands in one piece.
 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
- H. Mounting: Wall extension brackets mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- I. Shade Operation - Motorized operator: Locations indicated.
 1. Shades for each area shall function as one group; all shades and all sides raising and lowering simultaneous, as Thermoveil Shadecoloth.
 2. Shades on same local switch.

2.2 ROLLER SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

- B. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
 - 1. Concealed hem tube (Translucent Shades).
- C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

2.3 MANUAL OPERATED CHAIN DRIVE HARDWARE AND BRACKETS

- A. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
- B. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
- C. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
- D. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
- E. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
- F. Drive Bracket / Brake Assembly:
 - 1. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - 2. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- G. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.4 MOTORIZED ROLLER SHADE OPERATORS

- A. Location: Cafeteria and Platform.
- B. Basis-of-Design Product: Specifications and design of shade motors and motor control system are based on the IQ/MLC motor logic control system manufactured by MechoShade Systems, Inc. Other systems may be acceptable provide that all of the following performance capabilities are provided. Motor logic control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
- C. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide

operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

D. Comply with NFPA 70.

E. Control Equipment:

1. Provide power to each shade motor via individual 3 conductor line voltage circuits connecting each motor to the relay based motor logic controllers (IQ/MLC).
2. Control system components shall provide appropriate (spike and brown out) over-current protection (+/- 10 percent of line voltage) for each of the four individual motor circuits and shall be rated by UL or ETL as a recognized component of this system and tested as an integrated system.
3. Control system shall allow for automatic alignment of shade hem bars in stopped position at 25 percent, 50 percent, and 75 percent of opening heights, and up to three user-defined intermediate stopping positions in addition to all up / all down, regardless of shade height, for a total of five positions. Control system shall allow shades to be stopped at any point in the opening height noting that shades may not be in alignment at these non-defined positions).
4. Control system shall have two standard operating modes: Normal mode allowing the shades to be stopped anywhere in the window's opening height and uniform mode, allowing the shades to only be stopped at the predefined intermediate stop positions. Both modes shall allow for all up / all down positioning.
5. Control system shall allow high rpm motors for shades over means of egress doors to be raised by input from building life safety system (at a speed / rpm determined by building code having jurisdiction), in addition to other modes of operation described in this specification.

F. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor Characteristics: Single phase, 110 V, 60 Hz.
3. Motor Mounting: Within manufacturer's standard roller enclosure.

G. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations:
 - a. Three-button architectural flush mounted switches with metal cover plate and no exposed fasteners.
 - b. Connect local wall switches to control system components via low voltage (12V DC) 4-conductor modular cable equipped with RJ-11 type connectors supplied, installed and certified under Division 16 - Electrical.

2.5 SHADE CLOTH

- A. Translucent Single-Fabric Shadecloth: MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
 - 1. Shading:
 - a. Vertical Shades: Dense Weave "3000 Series", 3-5 percent open.
 - 2. Location: All exterior glazed openings.
- B. Blackout Shadecloth: PVC-free fiberglass material with an opaque acrylic backing.
 - 1. Content: 66% acrylic (coating), 34% fiberglass (yarn)
 - 2. Openness factor: 0% (opaque)
 - 3. NFPA 701-2004: pass
 - 4. Location: Cafeteria electric shades.
- C. Colors: Selected from manufacturer's full range of colors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions. Allow clearances for window operation hardware.
- B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION

SECTION 12 35 50 - EDUCATIONAL CASEWORK**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes plastic laminate casework and related items including, but not limited to, countertops, back splashes, filler panels, and scribe pieces, as necessary for complete installation.
 - 1. Related Sections include the following:
 - a. Division 8 Section "Resilient Flooring" for resilient wall base.
 - b. Division 25 Sections for sinks and fittings in countertops.
 - c. Division 26 Sections for electrical fittings and outlets.

1.2 SUBMITTALS

- A. Product Data: For each type of educational casework unit specified.
- B. Shop Drawings: Include plan layout, elevations, ends, cross-sections, location and type of service fittings, required clearances, methods of assembly and reassembly, design and arrangements.
- C. Samples for Selection: Manufacturer's color charts and material samples showing full range of colors, textures, and finishes. Submit a basic container unit with shelves, dividers, base and hardware. Samples must have cutaways to clearly demonstrate materials, construction, workmanship, and finish.
- D. Sample for Verification: Submit full size sample of typical cabinet which may be incorporated into the Work if in good condition and approved by Architect. Owner may take one cabinet unit off site for deconstructive testing. Cabinet will be selected at random. Replace unit at no extra cost to Owner.
- E. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.
- F. Maintenance Data: For educational casework to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.
- H. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For composite wood, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 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 laminate, if available: Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 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 Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

1.3 QUALITY ASSURANCE

- A. Forest Certification: To the extent necessary to meet required LEED threshold, 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. Installer Qualifications: Engage a firm specializing in installation of casework for a minimum of 5 years and acceptable to manufacturer.
- C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Unless modified by notation on Drawings, or otherwise specified, catalog description for designated product constitutes requirements for each product and establishes a standard of design and quality for materials, construction and workmanship. Other acceptable manufacturers' laboratory casework of similar sizes, similar door and drawer configurations, and complying with the Specifications will be accepted
- D. Single Source Responsibility: To assure coordinated unit design, all items in each room or space, other than appliances and special equipment specified in other Sections, shall be products of one manufacturer to the greatest extent possible.
- E. Quality Standard: Except as otherwise indicated, comply with the following standards:
 - 1. AWI Cabinet Quality Standard: AWI Section 1600.
 - 2. AWI Countertop Quality Standard: AWI Section 400C.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Administrative Requirements."

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating educational casework without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of educational casework that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: 3 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Case Systems, Inc.
2. LSI Corp. of America, Inc.
3. The Mastercraft Woodworking Company.
4. Southside Manufacturing Corp.
5. TMI Systems Design Corporation.
6. Paragon Casework.

2.2 MATERIALS

- A. Composite wood installed within the building interior: Comply 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.
- B. High Pressure Decorative Laminate: NEMA LD3, grades as indicated.
 1. Plastic Laminate: Vertical General Purpose Grade (VGS), 0.030-inch nominal thickness; for exterior cabinet surfaces, interiors of open cabinets, and underside of wall cabinets.
 2. Plastic Laminate Balancing Sheet: Cabinet Liner Grade (CLS), 0.020-inch nominal thickness, white high-pressure cabinet liner, for balancing exterior laminate surfaces.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Nevamar; International Paper; Decorative Products Div.
 - c. Wilsonart International; Div. of Premark International, Inc.
 2. Colors: As selected by Architect from manufacturer's full range of finishes and colors consisting of both patterns and solid colors. Provide a minimum of 100 patterns/colors to select from.
 3. End panels may match face or may be a color as selected from manufacturer's standard finishes and colors.
 4. A maximum total of 12 different casework colors will be selected for this Project. All exposed exterior elements including edges, door and cabinet sides, and exposed backs shall be available in matching color.
- D. Pressure Fused Laminate: Melamine resin impregnated, 90 gram PSM minimum, thermofused to core under pressure, complying with NEMA LD3 VGS and NEMA LD3 CLS standards.
 1. Provide white pressure fused laminate for cabinet interiors behind doors and drawers.
 2. Provide balanced construction at all concealed surfaces with thermofused melamine. Unsurfaced coreboard or simple backers will not be accepted.
- E. Plywood complying with DOC PS 1.
- F. Hardboard:
 1. Hardboard shall meet or exceed Commercial Standards CS-251 and Federal Specifications LLL-B-00810.
 2. Tempered Hardboard 1/4 inch thick, smooth both sides.
 3. Hardboard exposed one side to be 1/4 inch thick, prefinished in putty color to match cabinet interior. Opposite face prefinished with neutral color balance coating.
- G. Edging Materials: Comply with the following:
 1. Exposed Exterior Cabinet Edges, Interior Dividers, Drawer Bodies, and Shelves: Banded with matching material, resistant to chipping, cracking, and high impact, applied with waterproof hot melt adhesive.

2. Door and Drawer Front Edges: Banded with contrasting or matching PVC extrusion, 3 mm thick, resistant to chipping, cracking, and high impact, applied with waterproof hot melt adhesive, and shaped to provide radiused edges and corners.
3. Color selection for PVC edging will be made at a later date; Architect reserves the right to select colors manufactured and offered by Woodtape Edge Banding (at no additional cost to the Owner), when a standard selection offered by the casework manufacturer does not provide a suitable color in the Architect's opinion.

H. Hardware:

1. Hinges: Hinges fully concealed from view when door is in closed position and shall permit 176-degree door swing. Hinge crank of heavy duty steel with a concealed integral self-closing spring mechanism. Hinge bosses of heavy duty diecast steel. Nylon expansion inserts to be provided in door for positive screw attachment. Hinge shall incorporate mounting features providing three-dimensional adjustment. Hinges to have lifetime guarantee as warranted by manufacturer. Doors less than 48 inches in height with 2 hinges per door, doors 48 to 63 inches in height with 3 hinges per door and all doors in excess of 63 inches with 4 hinges per door.
2. Wire Pulls: Stainless steel, accurately positioned on door and drawer front with #8-32 screws.
3. Door Catch: Heavy duty, spring-loaded, large roller type. Each door with a single catch mounted at the bottom edge. All mobile cabinets and doors over 48 inches high with a catch at both top and bottom of door.
4. Catch Strike Plate: Injection molded nylon, almond color, with integral molded engagement ridge. Strike plate to also provide a wide face bumper insuring a positive door stop.
5. Hanger Rods: 1-inch diameter heavy gage plated tubing, securely affixed in cabinet with injection molded rod sockets.
6. Drawer and Slide-Out Shelf Slides: Nylon roller steel slides to insure quiet, smooth operation. 100-lb load rating with built-in drawer stop and self-close feature in the last 1-inch of travel.
7. File Drawer Slides: Full extension steel slides with ball bearing nylon rollers. 100-lb. load rating.
8. Locks: Cylinder type, diecast, with 5 disc tumbler mechanism. Each lock to be provided with a milled brass key with keying options of keyed alike, keyed different, and master keyed locks, as selected by Owner. Provide locks on all cabinet doors and drawers, except sink and fumehood base cabinets.
9. Grommets: Plastic or metal, 1.5-inch-diameter, placed at each computer station.

I. Adjustable Shelf Support System:

1. Support Clips for Adjustable Shelves: 3/4-inch-and 1-inch-thick, injection molded nylon, incorporating integrally molded lock tabs to retain shelf from tipping or inadvertently being lifted out. Support clip to have double pin engagement into precision bored hole pattern in cabinet vertical members, with molded ridge in the clip body to provide additional pressure against edge of shelving and to maintain positive pin engagement. Clip shall be designed to provide means to permanently attach shelf to support clips. Static test load must exceed 200-lb per clip.
2. Vertical and Horizontal Shelf Dividers: 1/4-inch-thick, fully adjustable and retained with injection molded nylon support clip designed to trap divider to eliminate inadvertent lift out.

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- 3. Adjustable Shelves and Dividers: Adjustable at 1.25 inches o.c. through full height of compartment.
 - J. Wardrobe Clothes Pole: 1-1/16-inch chrome steel rod – LH-362.
 - K. Wardrobe Clothes Pole Socket: Knappe & Vogt #734 Flange Chrome.
 - L. Coat Hooks:
 - 1. Single coat hooks - HEWI No. 520.60.1 ABS plastic, color to be selected by Architect from manufacturer's full range.
 - 2. Double coat hooks - HEWI 520.50.2 ABS plastic, color to be selected by Architect from manufacturer's full range.
 - 3. Ceiling hooks - HEWI 513 ABS plastic, color to be selected by Architect from manufacturer's full range.
 - M. Hangers: Captive and removable wood or metal; 17-inch.
 - N. Recycled Content: Provide particleboard and MDF with minimum 80 percent recycled content.
 - O. Interior wet-applied adhesives, sealants, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- 2.3 COUNTERTOPS
- A. Reference Section 12 36 00 Countertops.
- 2.4 FABRICATION, GENERAL
- A. Cabinet Construction: High-pressure plastic laminate surface finish; flush overlay type door/drawer style.
 - B. Chemical Content: All materials used shall be relatively nontoxic when exposed to heat or flame.
 - C. Wall Hung Units: When mounted on a wall and loaded with 25 psf on all horizontal surfaces, units shall resist a lateral force applied at the bottom of the cabinet parallel to the long dimension of the cabinet of 300 lbs without failure. Each wall hung unit shall safely support a uniform load of 600 lbs.
 - D. Storage units with or without doors shall be able to have shelves and/or vertical dividers rearranged within one or more units of same size without defacing interior of unit.
- 2.5 FABRICATION, CABINETS
- A. Drawers:
 - 1. Drawers: Full box body design with a separate front; body sides and ends minimum 5/8-inch medium density fiberboard with almond color melamine laminate faces and matching almond color PVC top edges; bottoms minimum 1/4-inch thick medium density fiberboard with almond color facing.
 - 2. Corner Joints: Interlocking dowel pin design, with 8mm diameter dowel pins inserted into drawer ends and fitted into matching hole patterns in drawer sides. Bottoms to be let into grooves all four sides; all joints glued and bottoms shall have additional mechanical fasteners; drawers to operate on mechanical slides as separately described.
 - 3. Separate drawer front, surfaced and edges as described, attached to drawer body with no less than 4 screws through front side.
 - B. Solid Hinged Doors: 3/4-inch thick plywood core, balanced construction laminate faces. Surfacing, edging and hinges as separately described.
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- C. Solid Sliding Doors: 3/4-inch thick plywood core, balanced construction laminate faces. Each door with 2 nylon rollers mounted in bottom of door panel, and with door operating in aluminum top and bottom tracks. Surfacing and edging as separately described.
- D. Sliding Display Doors: Constructed of 1/4-inch thick, distortion free glazing sheets. Outer edge to have full length aluminum pull channel for strength. Doors must be accurately sized for easy movement in upper and lower extruded aluminum guide channels.
- E. Adjustable Shelves: Shelves less than 36 inches in length shall be 3/4 inches thick. Shelves 36 inches long and over, and all adjustable shelves in wall cabinets and bookcases shall be 1 inch thick. Shelves shall be constructed of plywood with almond color melamine laminate surfaces. Leading edge of shelf finished with a high impact, rigid PVC extrusion, almond in color to match shelf surface and cabinet interior. Exposed surfaces of open shelving without doors shall be finished with plastic laminate.
- F. Frame Rails Between Drawers: Full cabinet length, 3/4 inches thick by 3-1/2 inches wide, pinned, and fastened into cabinet sides. Front leading edge to be edged as separately described.
- G. Tote Trays: High impact polystyrene with smooth edges. Provide each tray with a card holder. Suspend tote trays from rails securely attached to cabinet partitions and sides.

2.6 FABRICATION, FIXED CASEWORK (BASE, WALL, HUTCH, AND TALL UNITS)

- A. Corner Joints: Incorporate fluted hardwood dowel pin construction, factory glued and clamped under pressure to assure rigid loadbearing corner joints.
- B. Cabinet Ends: 3/4-inch-thick panels of balanced construction, precision bored for fluted hardwood dowel pins installed in horizontal cabinet members. Base and tall units with one piece end panels continuous to floor for added load capability. Unexposed ends with laminate backing sheet.
- C. Cabinet Bottoms and Tops: 3/4-inch-thick panels of balanced construction for base and tall units. Precision bore panels to receive fluted hardwood dowel pins inserted with glue. Dowel pins shall extend from the panel ends for joining into mating hole patterns in the cabinets' side panels.
- D. Wall Cabinets: Full 1-inch-thick panels of balanced construction, with the same fluted hardwood fluted dowel pin and glue joint construction as the base and tall cabinets.
- E. Kick Panels: 4-inch-high, set back from cabinets' front edge and mechanically fastened to cabinet bottom and ends, to be an integral part of cabinet structure.
- F. Back Panels: 3/8-inch-thick, set in 3/8 inch from rear panels of balanced construction surfaced as described.
- G. Finished exposed backs of fixed cabinets shall be 3/4-inch-thick panels of balanced construction surfaced as described.
- H. Hanging rails to be provided in wall cabinets in upper back corner for mounting units to walls.
- I. Cabinet Subbase:
 - 1. To be separate and continuous (no cabinet body sides-to-floor), water-resistant exterior grade plywood with concealed fastening to cabinet bottom.
 - 2. Ladder-type construction of front, back and intermediates to form a secure and level platform to which cabinets attach.

2.7 FABRICATION, MOBILE CASEWORK

- A. Corner Joints: Incorporate a rigid fluted hardwood dowel pin construction system, glued and clamped under pressure.
- B. Ends: 3/4-inch-thick panels of balanced construction precision bored for dowel pins installed in horizontal cabinet members.
- C. Mobile Cabinets: Provide with a double bottom and top frame panel design.
 - 1. Interior bottoms and tops, 3/4-inch-thick panels of balanced construction. The front leading edge of these panels built-up to 1-1/2 inch thick and edged with rigid PVC. Panels bored to receive fluted dowel pins with pins to be inserted with glue and join mating hole pattern in cabinet side panel.
 - 2. Exterior bottoms and tops, 3/4-inch thick panels of balanced construction. Panels to extend past all four sides of the unit and edged with high impact plastic extrusion to form a wrap-around bumper system to prevent damage during normal use. Bumper system shall be standard on all mobile units.
- D. Casters: Provide each mobile cabinet with four heavy duty 5-inch ball bearing swivel casters with a minimum wheel face of 1-1/4 inches, and 290-lb working load rating per caster. Provide two front casters with wheel lock. Attach each caster with four flat head bolts with lock nuts through bottom panels.
- E. Backs: 3/4-inch-thick panel of balanced construction and finished with exterior surfaces laminate. Backs tenoned into cabinet ends and grooved to accept interior top and bottom panels, and fastened with glue, screws, and corner brackets.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for, installation tolerances, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Do not install casework units until painting and drywall work in the space has been completed and the space is dry.
- B. Install cabinets in such a way that relocation can be accomplished without marred end panels and use of special tools.
- C. Install cabinets under supervision of manufacturer's representative with factory-trained journeymen authorized by manufacturer.
- D. Install cabinets indicated on Drawings in correct locations.
- E. Erect casework straight, level and plumb and securely anchor in place; base cabinets installed on plywood ladder bases.
- F. Mount wall-hung cabinets on concealed 1-by-3 softwood hanging strips secured to wall with expansion or toggle bolts, minimum four per cabinet.
- G. Firmly anchor fixed cabinets and any required scribe moldings to walls and floors. Finish of scribe molding shall match cabinets.
- H. Furnish scribes 3/4 inch thick and filler pieces to fill spaces in material matching cabinet panels or frames, between units and between units and walls where open spaces occur.

- I. Patch surfaces damaged by installation to new condition or remove and install new material as approved.
- J. Rims of sinks specified in Division 22 shall be set in sealant to insure waterproof seal between rim and countertop.
- K. Seal joints between all cabinets and wall.

3.3 CLEANING AND PROTECTION

- A. Leave finished work clean, free of scratches, dents, gouges, or other damage, with doors and drawers operating freely at time of final acceptance. Leave work area clean and free of debris.
- B. Protect materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 12 35 51 - MUSICAL INSTRUMENT STORAGE CABINETS**PART 1 GENERAL****1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Musical instrument and uniform cabinet system.

1.2 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Design system of storage cabinets for uniforms (ventilated) and musical instruments which are chip- and abrasion-resistant under normal usage and will protect instruments and cases from damage under normal use.
 - 2. Design shelving to withstand continuous use without surface or front edge breakdown.
 - 3. Design cabinet panels with polyester laminate on both sides to provide modularity and/or relocation of any cabinet.

1.3 PERFORMANCE REQUIREMENTS

- A. Hanger rods shall support a minimum vertical load of 200 lbs applied anywhere.
- B. Full height doors shall support a minimum vertical live load of 315 lbs applied to outer edge.
- C. Compartment door hinges must be through-bolt construction to cabinet panels; other attachment will not be accepted.

1.4 SUBMITTALS

- A. Product Data: Applicable reference standards, performance data, and application recommendations and limitations, and finishes.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, and hardware.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material exposed to view.
- D. Samples for Verification: For the following materials, in sets showing full range of color, texture, and pattern variations expected:
 - 1. Plastic Laminate for Casework Finish: 8 by 10 inches.
 - 2. Hardware: One unit of each type of exposed hardware.
- E. Product Schedule: For musical instrument storage cabinets. Use same designations indicated on Drawings.
- F. Product Certificates: For each type of musical instrument storage cabinet, signed by product manufacturer certifying that products furnished comply with requirements.
- G. Maintenance Data: To include in maintenance manuals.
- H. Warranty: Special warranty specified in this Section.
- I. Submit certification of application of borate treatment to woodwork in contact with slab.
- J. LEED Submittals: Comply with Section 018113.
 - 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 CoC.
2. 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.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of musical instrument storage cabinet manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain cabinets through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, dimensional requirements, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Product Requirements."
- D. Quality Standards: Unless otherwise indicated, comply with the following standards:
 1. ANSI/BHMA Standard A156.9, Grade 1.
 2. American Laminators Association Performance Standard ALA 1985.
- E. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver musical instrument storage cabinets only after painting and similar operations that could damage, soil, or deteriorate cabinets have been completed in installation areas where cabinets must be stored in other than installation areas; store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install musical instrument storage cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where musical instrument storage cabinets are indicated to fit to other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating musical instrument storage cabinets without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of cabinets.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of musical instrument storage cabinets that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Delamination of components or other failures of glue bond.
 - 2. Warping of components.
 - 3. Failure of operating hardware.
 - 4. Deterioration of finishes.
- B. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Wenger Corporation (Basis-of-Design).
 - 2. Case Systems (modified for performance requirements).
 - 3. LSI Corporation of America, Inc. (modified for performance requirements).

2.2 MATERIALS

- A. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Particleboard: ANSI A208.1, Type M-3 Exterior Glue complying with requirements in ANSI A208.1, Grade M-3.
 - 3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no added urea formaldehyde.
- B. Thermoset Decorative Panels: Particleboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- C. High-Pressure Decorative Laminate: NEMA LD 3.
- D. Composite wood installed within the building interior: Contain no added formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.

2.3 MATERIALS, GENERAL

- A. Cabinet Wall Panels: 3/4-inch-thick industrial (cabinet) grade particleboard, minimum 48 pcf with thermoset polyester laminate on both sides for totally finished construction.
- B. Cabinet Shelving:
 - 1. Cabinets up to 27 Inches Wide: One-piece, high molecular, blow-molded polyethylene with radiused front edge. Mount to cabinet walls with one-piece molded rigid ST nylon clip. Shelf is replaceable.

2. Cabinets over 27 Inches Wide: One-piece, high molecular-formed polyethylene with radiused front edge and 3/16-inch wall thickness. Ribbed for structural integrity. Supported by four 1-by 1-1/2 inch steel tubes with 0.060-inch-thick wall thickness and 0.075-inch-thick plates welded to ends.
- C. Wood Doors: Same construction as cabinet walls.
 1. Finish: Maple.
 - a. Available Product: Timber Products; Plank Maple Birch.
 2. Hardware:
 - a. Hinges: 5-knuckle, institutional type hinge, capable of supporting 315 lbs. dynamic vertical load. Hinge pin shall be 2-3/4 inches long. Fastened to cabinet and door with through-bolt construction. Provide two hinges on compartment doors; four hinges on full height doors.
 - 1) Finish: Powder coating.
 - b. Lock: Locking slide-bolt designed for padlocks, with strike plate; 0.105-inch-thick steel. Provide clear plastic label holder for identification card insert.
 - 1) Finish: Powder coating.
- D. Grille Doors: Welded steel grille construction with powder coat finish. Welds at tee-joints shall be 360 degrees.
 1. Hardware:
 - a. Hinges: 5-knuckle, institutional type hinge, capable of supporting 315 lbs. dynamic vertical load. Hinge pin shall be 2-3/4 inches long. Weld to door frame in five places. Fasten to cabinet and door with through-bolt construction. Provide two hinges on compartment doors; four hinges on full height doors.
 - b. Finish: Powder coating.
- E. Edging: Heat bonded 3 mm beveled PVC edge-banding.
- F. Finish Hardware:
 1. Joinery Hardware: 2-inch, 1/4-20 panel connectors with 15 mm head diameter, and steel thread inserts.
 2. Cabinet Levelers: Four leveling glides within minimum 3/8-inch diameter threaded rod in steel corner brackets, six glides for cabinets with divider panels.
- G. Cabinet Back Panel:
 1. Cabinet Back: 1/4-inch-thick prefinished hardboard. Match color of interior side of top panels.

2.4 ACCESSORIES

- A. Vertical Closure Kit: Provide visual closure between wall and cabinet. Constructed of 3/4-inch-thick thermoset polyester composite wood to match cabinet side panels for 3/4 inch to 30 inch wide openings.
- B. Horizontal Closure Kit: Provide visual closure between top of cabinet and soffit. Constructed of 3/4-inch-thick thermoset polyester composite wood to match cabinet side panels for 3/4 inch to 30 inch high openings.
- C. Top Back Filler Kit: Provide visual closure between back wall and top panel of cabinet. Constructed of 3/4-inch-thick thermoset polyester composite wood to match cabinet top panels for 10-inch and 20-inch deep openings.
- D. Finished Back Panel: Provide panel to attach to cabinet back that is exposed. Constructed of 1/2-inch-thick thermoset polyester composite wood to match cabinet.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for, installation tolerances, location of reinforcements, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CABINET ERECTION

- A. Install cabinet system in accordance with manufacturer's instructions.
- B. Install cabinet system with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- C. Install cabinet system without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- D. Install cabinet system level and plumb to a tolerance of 1/8 inch in 8 feet.
- E. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.
- F. Seal all joints between cabinets and walls.

3.3 TERMITE TREATMENT

- A. Field-apply borate surface treatment to lower 12 inches of woodwork in contact with slab on grade.

3.4 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean cabinets on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas to match original factory-finish as approved by Architect.

3.5 PROTECTION

- A. Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION

SECTION 12 36 00 - COUNTERTOPS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Countertops for architectural cabinetwork.
- B. Wall-hung counters and vanity tops.
- C. Natural Quartz and Resin Composite Window Sills.

1.2 RELATED REQUIREMENTS

- A. Section 06 41 00 - Architectural Wood Casework.
- B. Section 12 35 50 - Educational Casework.

1.3 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
- D. AWI/AWMAC (QSI) - Quality Standard Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- F. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- G. MIA (DSDM) - Dimensional Stone Design Manual; VII, 2007.
- H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- I. PS 1 - Structural Plywood; 2009.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- G. LEED Submittals: Comply with Section 018113.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For composite wood, if available: Product-specific declaration or Industry-wide EPD or product-specific EPD.

- 2. MR Credit 4: BPDO - Material Ingredients
 - a. For plastic laminate and solid surfacing material, if applicable: Material ingredient report.
 - 3. 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 v1.1-2010 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 Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
 - H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.
- 1.5 QUALITY ASSURANCE
- A. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.
 - B. Installer Qualifications: Fabricator.
- 1.6 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.
- 1.7 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 COUNTERTOP ASSEMBLIES

- A. Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.
 - 1. Laminate Sheet, Unless Otherwise Indicated: NEMA LD 3 Grade HGS, 0.048 inch nominal thickness.
 - a. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
 - b. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - c. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1) As selected by Architect from laminate manufacturer's full range in solid colors, wood grains, and patterns, including stone, marble and leathers.
 - 2) Ten different colors may be selected by Architect for this Project.
 - d. Manufacturers:
 - 1) Formica Corporation : www.formica.com.
 - 2) Lamin-Art, Inc : www.laminart.com.
 - 3) Panolam Industries International, Inc\Nevamar : www.nevamar.com.

- 4) Panolam Industries International, Inc\Pionite : www.pionitelaminates.com.
 - 5) Wilsonart International, Inc : www.wilsonart.com.
 2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with 3mm polyvinylchloride (PVC), machine applied with hot melt adhesive, inside/outside length radiused, corner radiused and buffed.
 - a. Color selection for PVC edging will be made at a later date; Architect reserves the right to select colors manufactured and offered by Woodtape Edge Banding (at no additional cost to the Owner), when a standard selection offered by the casework manufacturer does not provide a suitable color in the Architect's opinion.
 3. Back and End Splashes: Same material, same construction.
 4. Fabricate in accordance with AWI/AWMAC Quality Standards Illustrated Premium Grade.
- B. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
 1. Flat Surface Thickness: 1 inch, nominal.
 2. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
 3. Surface Finish: Smooth, non-glare.
 4. Color: Black.
 5. Back and End Splashes: Same material, same thickness; separate for field attachment.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/4 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 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. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: To be selected from manufacturer's full line.
 - d. Manufacturers:
 - 1) Dupont : www.corian.com.
 - 2) Formica Corporation : www.formica.com.
 - 3) Avonite Surfaces : www.avonitesurfaces.com.
 - 4) Wilsonart International, Inc : www.wilsonart.com.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 6. Skirts: As indicated on drawings.
- D. Metal Flake Acrylic Surface Material:
 1. Location: Where indicated on the drawings.
 2. Project Standard: Alkemi-Acrylic by Renewed Materials LLC; www.alkemi.com.
 - a. Recycled material composed of soft alloy aluminum scrap flake fillers.
 - b. Recycled Content: Minimum 30 percent post-industrial scrap.
 3. Honed texture.

4. Color: Clear-500.
5. Edges: Thickened eased and polished.
- E. Natural Quartz and Resin Composite Window Sills: Sheet or slab of natural quartz and plastic resin over continuous substrate.
 1. Flat Sheet Thickness: Nominal 1-1/4 inch (3 cm), minimum.
 2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic 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) Wilsonart: www.wilsonart.com.
 - 2) Cosentino: www.silestoneusa.com.
 - 3) LG Hausys: www.LGviateraUSA.com.
 - 4) Meganite; www.meganite.com.
 - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
 - c. Finish on Exposed Surfaces: Polished.
 - d. Edge: Eased.
 3. Other Components Thickness: 3/4 inch, minimum.
 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.2 ACCESSORY MATERIALS

- A. Wood-Based Components:
 1. Wood fabricated from old growth timber is not permitted.
 2. Composite wood installed within the building interior: Contain no added formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.
- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- C. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 47 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.
- D. Backer Sheet: Provide substrate with laminate backer sheet.
- E. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined. No added urea formaldehyde.
 1. Interior wet-applied adhesives and sealants: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."

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 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 skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

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 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. Attach epoxy resin countertops using compatible adhesive.
- D. Seal joint between back/end splashes and vertical surfaces.

3.3 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.

3.4 CLEANING AND PROTECTION

- A. Clean countertops surfaces thoroughly.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES**GENERAL****1.1 SUMMARY**

- A. Section includes: Entrance floor mats and frames, including fibered roll good entrance systems

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D 2859 Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
 - 2. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- B. Other referenced documents:
 - 1. Consumer Products Safety Commission (CPSC) FF 1-70: Pill Test
 - 2. Department of Commerce (DOC) FF 1-70: Pill Test
 - 3. LEED v4

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Install entrance matting after finishing operations, including painting and ceiling operations, have been completed.
- B. Preinstallation Meetings: Meet to confirm project requirements, substrate conditions, and manufacturer's installation instructions and warranty requirements in compliance with Division 1 requirements.

1.4 ACTION SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures.
- B. Product Data: For specified products, submit latest edition of product supplier's technical specifications data.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components.
- D. Samples: Submit selection and verification samples showing the required finishes, colors, designs, and textures for flooring, as well as samples of adhesives and applicable accessories such as nosing, frames, etc.

1.5 INFORMATION SUBMITTALS

- A. Test and Evaluation Reports:
 - 1. Product test reports: Submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.
- B. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning and maintenance instructions.
- C. Sustainable Design Submittals:
 - 1. Submit documentation substantiating that products contain a minimum of 10% post-consumer recycled content and therefore contributes to Materials and Resources Sourcing of Raw Materials Credit.
 - 2. Submit documentation substantiating that the project has permanent entryway system at least ten feet in length that is maintained on a weekly basis and therefore contributes to Indoor Environmental Quality Enhanced Indoor Air Quality Strategies Credit.

1.6 CLOSEOUT SUBMITTALS

- A. Warranty documentation: For specified products and accessories, submit product supplier's warranty documents.

1.7 QUALITY ASSURANCE

- A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.
- B. Storage and Handling Requirements: Store material, including any adhesive and accessories, in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions.

1.9 AMBIENT SITE CONDITIONS

- A. The permanent HVAC system shall be operational and set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation, during the time of installation, and for 48 hours after installation has been completed. Thereafter, minimum temperature shall be 55°F.

PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Mats Inc., Chicago or New York Collection as selected by Architect.
- B. Characteristics :
 - 1. Construction: 100% polyamide nylon 6.6 fiber
 - 2. Backing: Manufacturer's standard vinyl product for roll-up mats.
 - 3. Thickness: Vinyl backing 3/8-inch.
- C. Performance: Physical properties of the entrance matting shall conform to the following minimums:
 - 1. Safety:
 - a. Surface flammability: ASTM D2859: Pass (equal to CPSC FF 1-70)
 - b. Critical radiant flux: ASTM E648: Class 1
- D. Accessories:
 - 1. Standard glue-on nosing
 - 2. Aluminum framing: As recommended by manufacturer.

EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Subfloors shall be clean and dry. Inspect all substrates and subfloors for proper tolerances, and report any discrepancies to the general contractor in writing.
- B. Preinstallation Measurements: Verify actual measurement by field measuring before any onsite cutting, if applicable. To avoid construction delays, coordinate field measurements based upon construction progress.

3.2 SURFACE PREPARATION

- A. Concrete subfloors: Where concrete subfloors are present, all work required to put the concrete subfloor in acceptable condition shall be the responsibility of the general contractor.

3.3 INSTALLATION

- A. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.
- B. Accessory selection: Where indicated for recessed or wall-to-wall applications provide aluminum framework as recommended by manufacturer. Where indicated for surface-mounted applications, provide tapered vinyl moldings with flanges sewn to back of mat on all four sides with mitered corners.

3.4 CLEANING

- A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.
- B. Initial Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer's maintenance instructions. Instruct owner's cleaning staff in proper maintenance procedures.

END OF SECTION

SECTION 12 93 00 - SITE FURNISHINGS**PART 1 - GENERAL:****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following site and street furnishings:
 - 1. Bike Racks
 - 2. Basketball Backstops, Supports, and Striping Paint
 - 3. Benches.
 - 4. Trash receptacles.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthwork" for excavation for installation of concrete footings.
 - 2. Division 3 Section "Cast-in-Place Concrete" for formed voids in concrete footings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
 - 1. Submit location of product manufacture
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Size: Not less than 6-inch- long linear components and 4-inch- square sheet components.
- C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- D. Material Certificates: For site furnishings, signed by manufacturers.
 - 1. Recycled plastic.
- E. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site and street furnishings through one source from a single manufacturer.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Bench Replacement Slats: Not less than two full-size units for each size indicated.
 - 2. Trash Receptacle Inner Containers: 1 full-size unit.

PART 2 - PRODUCTS:**2.1 MATERIALS**

- A. Steel: Free from surface blemishes and complying with the following:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.

3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Sheet: Commercial steel sheet complying with ASTM A 569/A 569M.
- B. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
 1. Recycled Polyethylene: Fabricated from not less than 96 percent recycled, purified, fractional-melt plastic resin for not less than 90 percent recycled post-consumer waste by weight content HDPE.
- C. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site furnishings' assembly, mounting, and secure attachment.
- D. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

2.2 BENCHES:

- A. Benches: Basis-of-Design; Barco Products.
 1. Location: As indicated on the drawings.
 - a. Barco Model: To Be Determined.
 - b. Wood grain finish, recycled plastic boards.
 - c. Metal: Powder coated.
 - d. Mounting: Surface.
 - e. Length: 6 feet.
 - f. Color: As selected from manufacturers full range of colors.

2.3 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Steel and Iron Components: Galvanized, galvanized and color coated, or color coated. Bare metal steel or iron components are not permitted.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; smooth all surfaces, free from burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to the greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL AND GALVANIZED STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester-TGIC, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION:

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site and street furnishings, where required.
- B. Unless otherwise indicated, install site and street furnishings after landscaping and paving have been completed.
- C. Install site and street furnishings level, plumb, true, and securely anchored or positioned at locations indicated on Drawings.

3.3 CLEANING

- A. After completing site and street furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 14 24 00 - PASSENGER ELEVATORS**PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Electric Traction Elevators.
- B. Products provided under separate Section:
 - 1. Hoist Beam
 - 2. Pit Ladder
 - 3. Elevator Sump Grate
- C. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
 - 8. Access Doors: As required for access to governor. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.
- D. Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.2 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment: (Basis-of-Design) KONE EcoSpace™ gearless traction elevator
- B. Equipment Control: KCM831
- C. Quantity of Elevators: 1
- D. Landings: 2
- E. Openings: 2 Front Openings
- F. Travel: Refer to Drawings
- G. Rated Capacity: 2,500 lbs
- H. Rated Speed: 150 fpm
- I. Clear Inside Dimensions (W x D): 6'-8" x 5'-0
- J. Cab Height: 8'

- K. Clear height under suspended ceiling: 7'9"
- L. Entrance Width & Type: 3'-6"; Center Opening
- M. Entrance Height: 7'
- N. Main Power Supply: 480 Volts + 5%, three-phase
- O. Operation: Simplex
- P. Machine Location: Inside the hoistway mounted on car guide rail
- Q. Control Space Location: Remote Closet
- R. Elevator Equipment shall conform to the requirements of seismic zone: Class E.
- S. Provide phone line monitoring in conformance with ASME 2009 elevator codes, including audible alarm.
- T. Provide with Card Reader connected to the Owners key card system. Card reader to be mounted in the corridor. Elevator operation is to be locked out unless a valid card is presented at the card reader.
- U. Maintenance Service Period: 24 Months
- V. Protective Pads: Provide two sets of quilted fire retardant protective pads and hooks.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. Color selection charts for cab and entrances.
- B. Shop Drawings:
 - 1. Clearances and travel of car.
 - 2. Clear inside hoistway and pit dimensions.
 - 3. Location and layout of equipment and signals.
 - 4. Car, guide rails, buffers and other components in hoistway.
 - 5. Maximum rail bracket spacing.
 - 6. Maximum loads imposed on building structure.
 - 7. Hoist beam requirements.
 - 8. Location and sizes of access doors.
 - 9. Location and details of hoistway door and frames.
 - 10. Electrical characteristics and connection requirements.
- C. LEED Submittals: Comply with Section 018113.
 - 1. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives, sealants, paints, coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L. Include volume of material applied per product.
 - b. For resilient flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
 - c. 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. Operation and maintenance data:
 - 1. Provide manufacturer's standard maintenance and operation manual.
- E. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- square Samples of sheet materials; and 4-inch lengths of running trim members.
- F. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- G. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - a. Diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
 - 1. As required by Maryland State law, the Contractor must have a Qualified Elevator Inspector conduct the required inspection prior to the State elevator inspection.
 - 2. Include all necessary third-party inspections required prior to the State elevator inspection, within the Contract.
 - 3. The cost of the State inspection call-backs or additional third-party inspections, resulting from additional or missed items following the initial third-party inspection, will not be an additional cost to the Owner.
- I. Field Quality Control Certificate: Final inspection and maintenance certificate specified in this Section.
- J. Warranty: Special warranty specified in this Section.
- K. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Minimum of ten years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.
- D. Source Limitations: Obtain elevators through one source from a single manufacturer. Only elevator systems and components manufactured in the United States are acceptable for use on this Project.
- E. Regulatory Requirements: Comply with ASME A17.1.
 - 1. Elevator importance factor is 1.0.
- F. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

- G. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.
- H. Product Requirements:
 - 1. Adhesive and sealants used on the interior of the building must meet SCAQMD and aerosol adhesives that meet Green Seal Standard GS-36.
 - 2. Bonding agent for composite wood products can not contain added urea-formaldehyde.

1.5 DELIVERY, STORAGE AND HANDLING

- A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the general contractor.
- B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.6 COORDINATION

- A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.
- B. Furnish well casing and coordinate delivery with related excavation work.
- C. Coordinate sequence of elevator installation with other work to avoid delaying the Work.
- D. Coordinate locations and dimensions of other work relating to elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.7 WARRANTY

- A. Provide manufacturer warranty for a period of two years. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.
 - 1. Notification: Notify Owner, in writing, 60 days in advance of date of expiration of warranty. Failure to notify Owner by required time shall automatically extend warranty to 60 days after written notification is received by Owner at no additional cost to Owner. Extended warranty period shall be considered part of, and manufacturer is fully responsible for Work described in original warranty.
 - 2. Warranty Claim: Warranty claims made by Owner prior to expiration of warranty shall be satisfied even though the warranty has subsequently expired.

1.8 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 24 Months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.

- B. Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.
- D. Include 24-hour-per-day, 7-day-per-week emergency callback service.
 - 1. Response Time: Two hours or less.
- E. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard two-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of Design: EcoSpace™ traction elevators by KONE, Inc. (www.kone.com).
 - 2. Other acceptable machine room-less products:
 - a. Otis Elevator Co. - Gen2™ Product
 - b. Schindler Elevator Corp. - 400A Product

2.2 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.
 - 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 - 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 - 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location: Within 100'-0" (30.48m) Controller(s) shall be located in a remote cabinet or room within 140'-0" (42.6 m) wire feet of the elevator machine.

2.3 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- D. Hoistway Operating Devices:
 - 1. Emergency stop switch in the pit
 - 2. Terminal stopping switches.

- 3. Emergency stop switch on the machine
- E. Positioning System: System consisting of magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.4 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: extruded.
 - 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 - 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 - 4. Entrance Finish: Brushed stainless steel frame.
 - 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.
 - 6. Car Front Finish: Satin Stainless Steel, No. 4 Finish.

2.5 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.6 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Platform: Platform shall be all steel construction.
- C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Steel Cab:
 - 1. Car Wall Finish: Plastic laminate with stainless steel reveals; no added urea formaldehyde.
 - 2. Car Door Finish: Satin stainless steel, No. 4 finish.
 - 3. Ceiling: Kone LF-98 Satin Stainless Steel with Rectangular LED Lighting.
 - 4. Handrail:
 - a. 1-1/2 inches round satin stainless steel with return ends, No. 4 finish, at sides of car.
 - 5. Flooring: Floor prepared to receive scheduled flooring.
 - 6. Threshold: Aluminum
 - 7. Field-applied adhesives, sealants, paints and coatings: Comply with Section 016116 for low-emitting requirements.
 - 8. Composite wood and laminating adhesives: no added urea formaldehyde.
- E. Emergency Car Signals:
 - 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 3. Emergency Exit Contact: An electrical contact shall be provided on the car- top exit.
- F. Ventilation: Fan.
- G. Interior wet-applied adhesives, sealants, paints, and coatings: Comply with low-emitting requirements in Division 01 Section "Sustainable Design Requirements - LEED."
- H. Resilient flooring: Comply with California Department of Public Health (CDPH) Standard Method v1.1-2010 or Resilient Floor Covering Institute's (RFCI) FloorScore Certification.
- I. Composite wood installed within the building interior: Contain no added formaldehyde resins or comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins.

2.7 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation; provide KONE full-height Style Leaves in flax yellow color.
1. Car operating panel shall contain a bank of mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. All buttons to have raised text and Braille marking on left hand side. The car operating panel shall have a brushed stainless steel finish.
 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel (amber).
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help button markings with raised markings.
 - d. In car stop switch per local code.
 - e. Firefighter's hat.
 - f. Firefighter's Phase II Key-switch.
 - g. Call Cancel Button.
 - h. Pre-programmed integrated ADA phone (complete description of krms features included as standard).
 - 1) Provide phone line monitoring in conformance with ASME 2009 elevator codes, including audible alarm.
 - i. Help Button/Communicator. Activation of help button will initiate two- way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - j. Firefighter's Phase II emergency in-car operating instructions.
- B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.
1. Hall fixtures shall feature round, mechanical, illuminated buttons in raised fixture housings. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. Hall fixtures should not be jamb-mounted. Hall lanterns shall feature amber illumination.

- C. Hall Lanterns and Chime: A directional lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

1. KONE Series Design Signalization; Sand Yellow color.

2.8 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation:

1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
2. Zoned Car Parking.
3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection
5. Top of Car Inspection Station.

C. Additional Operating Features to include:

1. Independent Service.
2. Car Secure Access.
3. Provision for Card Reader in Car.

D. Elevator Control System for Inspections and Emergency:

1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.9 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.2 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.

- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.4 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - d. Coordinate interface of elevators and fire alarm system.
 - e. Coordinate interface of dedicated telephone line.

3.5 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.
- C. Final Inspection and Maintenance: Within seven days before Substantial Completion, Installer shall return to site and inspect elevators, clean equipment, and replace hoist equipment packings. Provide written certification with date that final inspection and maintenance was performed and indicate that the elevator is operating properly.

3.6 PROTECTION

- A. Temporary Use: Do not permit use of elevators for construction purposes or during construction period without written permission from Architect. When permitted, limit temporary use for construction purposes to one elevator. Comply with the following requirements for elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.7 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain required permits and provide originals to Owner's Representative.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s). Refer to Division 1 Section "Demonstration and Training."
- B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.
- C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION

