

BLUE HERON ELEMENTARY SCHOOL

Frederick County Public Schools

GWWO Project No. 18050

PSCP No. 10.018.20 LP



PROJECT MANUAL

VOLUME II

Divisions 01 thru 14

ISSUED FOR BID

JANUARY 17, 2020

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END OF SECTION

SECTION 01 1000 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

- A. The Project consists of the construction of two-story school building in New Market, Maryland. The primarily steel-framed (with select load-bearing concrete masonry) building will be clad in brick masonry with aluminum window and hollow-metal door openings and a single-ply roof. .

1.2 CONTRACT DESCRIPTION

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.

END OF SECTION

SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of alternates.

1.2 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.3 SCHEDULE OF ALTERNATES

- A. Alternate No. 01 - ADD SPECIALIZED INSTRUCTION CLASSROOM WING.:
 - 1. Base Bid Item: No classrooms or support spaces for Specialized Instruction.
 - 2. Alternate Item: Classroom wing that includes support spaces for Specialized Instruction, as indicated on the following drawing sheets:
 - a. Ax1-series.
 - b. Sx1-series.
 - c. Mx1-series.
 - d. Ex1-series.
 - e. Px1-series.
 - f. TEx1-series
- B. Alternate No. 02 - ADD TUBULAR SKYLIGHTS TO GYMNASIUM, CAFETERIA, AND MEDIA CENTER.:
 - 1. Base Bid Item: No tubular skylights.
 - 2. Alternate Item: Tubular skylights (Section 08 6223 - Tubular Skylights).
- C. Alternate No. 03 - DELETE VINYL COMPOSITION TILE (VCT) FLOORING IN "MAIN STREET" CORRIDOR, ENTRANCE VESTIBULES, AND CAFETERIA; ADD RESINOUS MATRIX TERRAZZO FLOORING IN "MAIN STREET" CORRIDORS, ENTRANCE VESTIBULES, AND CAFETERIA:
 - 1. Base Bid Item: VCT Flooring (Section 09 6500 - Resilient Flooring, Part 2.1, Paragraph A).
 - 2. Alternate Item: Resinous Matrix Terrazzo Flooring (Section 09 6623 - Resinous Matrix Terrazzo Flooring, Part 2.1).
 - 3. Spaces:
 - a. Main Street Corridor: Corridor 000, Bus Entry 000C, Vestibule 014, Vestibule 028, Corridor 100, Entry Vestibule 100A, Collaboration 100B, Corridor 100C, Collaboration 100D, Vestibule 100H, Stair A 159, and Stair B 175.
 - b. Cafeteria 115
- D. Alternate No. 04 - DELETE VINYL COMPOSITION TILE (VCT) FLOORING IN CLASSROOMS AND SELECT CORRIDORS; ADD LUXURY VINYL TILE (LVT) FLOORING IN CLASSROOMS AND SELECT CORRIDORS:
 - 1. Base Bid Item: VCT Flooring (Section 09 6500 - Resilient Flooring, Part 2.1, Paragraph A).
 - 2. Alternate Item: LVT Flooring (Section 09 6500 - Resilient Flooring, Part 2.1, Paragraph B).
 - 3. Spaces:
 - a. Classrooms: All Classrooms, Intervention 012, Intervention 026, Office 138, Intervention 150, Intervention 152, Office 160, Intervention 168, and Intervention 170.

- b. Select Corridors: Corridor 000A, Corridor 000B, Corridor 100E, Corridor 100F, and Corridor 100G.
- E. Alternate No. 05 - DELETE PLASTIC LAMINATE (PLAM) COUNTERTOP ASSEMBLY: ADD NATURAL QUARTZ AND RESIN COMPOSITE COUNTERTOP.
 - 1. Base Bid Item: PLAM Countertop Assembly (Section 12 3600 - Countertops, Part 2.1, Paragraph B).
 - 2. Alternate Item: Natural Quartz and Resin Composite Countertop Assembly (Section 12 3600 - Countertops, Part 2.1, Paragraph D).
 - 3. Spaces: All spaces with PLAM countertops.
- F. Alternate No. 06 - ADD FIRE PUMP AND ALL ASSOCIATED ACCESSORIES.
 - 1. Base Bid Item: No fire pump.
 - 2. Alternate Item: Add fire pump and all associated accessories as identified on the following drawings:
 - a. Ax6-series.
 - b. Sx6-series.
 - c. Mx6-series.
 - d. Ex6-series.
 - e. Px6-series.
 - f. TEx6-series.
- G. Alternate No. 07 - ADD FIVE (5) YEAR SERVICE CONTRACT FOR MECHANICAL UNITS.
 - 1. Base Bid Item: No Service Contract for Mechanical Units.
 - 2. Alternate Item: Five (5) year Service Contract for Mechanical Units; Work to include, but not be limited to:
 - a. Changing of filters.
 - b. Inspection of equipment.
 - c. Maintenance of equipment in accordance with manufacturer's requirements and recommendations.
 - 3. Section 23 0500 - Common Work Results HVAC.
- H. Alternate No. 08 - ADD ENERGY DASHBOARD.
 - 1. Base Bid Item: No Energy Dashboard.
 - 2. Alternate Item: Energy Dashboard to include, but not be limited to, the following monitoring activities:
 - a. Sub-metering of energy usage.
 - b. Weather conditions.
 - 3. Section 23 0900 - New Instrumentation and Control HVAC

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation Sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the Schedule of Values in duplicate within fifteen (15) calendar days after date of Owner-Contractor Agreement.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format: Utilize the Table of Contents of this Project Specifications. Identify each line item with number and title of the Specification Section. Identify mobilization and bonds and insurance..
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of State of Maryland IAC/PSCP Form 306.4.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Revise schedule to list approved Change Orders, with EACH Application for Payment.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Architect by the twentieth of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Submit draft copy of Application for Payment five business days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702, AIA Document G703 and IAC/PSCP Form 306.4 "Standard Monthly Contractor's Requisition for Payment" as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit six signed and notarized original s of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Release of Lien: With each Application for Payment, submit Release of Lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Release Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. All Applications 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. Schedule of values.
 3. LEED submittal for project materials cost data.
 4. Contractor's construction schedule (preliminary if not final).
 5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 6. Products list (preliminary if not final).
 7. LEED action plans.
 8. Schedule of unit prices.
 9. Submittal schedule (preliminary if not final).
 10. List of Contractor's staff assignments.
 11. List of Contractor's principal consultants.
 12. Copies of building permits.
 13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 14. Initial progress report.
 15. Report of preconstruction conference.
 16. Certificates of insurance and insurance policies.
 17. Performance and payment bonds.
 18. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues 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 Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 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 3329 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4/V4.1 FOR SCHOOLS

PART 1 GENERAL

1.1 SUMMARY

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

1.2 REPORTING REQUIREMENTS

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

1.3 DEFINITIONS

- A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.
- B. CDPH Standard Method v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.2-2017, for the emissions testing and requirements of products and materials.

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

- N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.
- O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.
 - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.2 definition.

1.4 REFERENCE STANDARDS

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

1.5 ADMINISTRATIVE REQUIREMENTS

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

- the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.6 INFORMATIONAL SUBMITTALS

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

- a. Low Emitting Materials Tracking Sheet monitoring the project's progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings.
- 7. EQ Credit 3, Indoor Air Quality, During Construction, complying with Division 01 Section "Indoor Air Quality Management."
- 8. EQ Credit 4, Indoor Air Quality Assessment, complying with Division 01 Section "Indoor Air Quality Management."

1.7 SUBMITTALS

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

- (b) Include a statement indicating percentage by weight of the total assembly that is bio-based.
 - 3) Certified Wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC number.
 - 4) Reused Materials: Invoices indicating source and end-use for reused materials.
 - 5) Recycled Content: Documentation indicating percentages by weight of total assembly pre-consumer and post-consumer recycled content.
 - 6) For products that meet one of the above and are regionally sourced material: Documentation indicating location of extraction, manufacture, purchase of primary raw materials.
- 4. MR Credit 4: BPDO - Material Ingredients - **Alternate Compliance with LEED v4.1.**
 - a. Option 1 - Material Ingredients Reports: Documentation demonstrating compliance with one of the following:
 - 1) Manufacturer Inventory
 - 2) Health Product Declaration (HPD)
 - 3) Cradle to Cradle (C2C) v3 Bronze level
 - 4) Cradle to Cradle Material Health Certificate: Bronze level or higher
 - 5) Declare Product Label - LBC Red List Free
 - 6) Declare Product Label - Declared
 - 7) Declare Product Label - LBC Compliant: Content inventory to 1000 parts per million (0.1%).
 - 8) UL's Product Lens Certification
- 5. MR Credit 5: Construction and Demolition Waste Management
 - a. Waste Management Progress Reports: Refer to Division 01 Section "Construction Waste Management and Disposal."
 - b. Option 1 - Path 2, Divert 75% and Four Material Streams.
 - c. Option 2, Reduction of Total Construction and Demolition Waste Material.
- 6. EQ Credit 2: Low-Emitting Materials - **Alternate Compliance with LEED v4.1.**
 - a. Refer to Division 01 "Volatile Organic Compound (VOC) Content Restrictions".
 - b. General Emissions Evaluation: Provide certificate stating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 including TVOC range for the following building materials:
 - 1) Paints and coatings wet-applied within the building interior.
 - (a) Include volume of material applied per product in liters (L).
 - 2) Wall Panels (gypsum board, plaster, wall covering, wall paneling, cubicle curtain, partition wall, doors, window treatments) installed within the building interior.
 - (a) Include material cost or total surface area per product in square feet (SF).
 - 3) Flooring installed within the building interior.
 - 4) Ceilings, walls (gypsum board and wallcovering), thermal and acoustic insulation installed within the building interior.
 - c. Composite Wood Evaluation: For composite wood permanently installed within the building interior, provide manufacturer product data indicating one of the following:
 - 1) Certification of compliance with California Air Resources Board (CARB), Airborne Toxic Control Measures (ATCM), Phase II, for ultra-low-emitting formaldehyde (ULEF) resins.
 - 2) No added formaldehyde (NAF) resin.
 - 3) For products claiming CARB exemption: Executive Order letter stating manufacturer, product name and the exemption.
 - d. Volatile Organic Compound (VOC) Content: Provide manufacturer product data indicating VOC content as measured in grams per Liter (g/L).

- 1) For wet-applied paints and coatings applied on the exterior and within the building interior.
7. EQ Credit 3: Construction IAQ Management
 - a. Refer to Division 01 "Indoor Air Quality Management".
 - b. Provide manufacturer product data indicating MERV rating of temporary and final filtration media.
 - 1) Include dates and locations of all filter replacement installations.
 - c. Provide 18 photographs, at least three different periods of time during construction to demonstrate the implementation of SMACNA measures, annotated with date measure in place, and general location of the photograph.
 - 1) Alternatively, provide a narrative demonstrating how the IAQ Plan was implemented and describing the protection of materials from moisture damage.

1.8 CLOSEOUT SUBMITTALS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROCEDURES

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

1. Certification signatures must be made by an officer of the company.
2. For products, certification must be made by the manufacturer not the supplier.
3. For custom fabricated products, certification by the fabricator is acceptable.

END OF SECTION



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

Project Checklist

Project Name: FCPS - Blue Heron Elementary School

Date: December 11, 2019

Y ? N

1			Credit	Integrative Process	v 4.1	1
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3	0	12	Location and Transportation			15
		15	Credit	LTc1 - LEED for Neighborhood Development Location		15
1			Credit	LTc2 - Sensitive Land Protection	v 4.1	1
		2	Credit	LTc3 - High Priority Site		2
		5	Credit	LTc4 - Surrounding Density and Diverse Uses		5
		4	Credit	LTc5 - Access to Quality Transit		4
		1	Credit	LTc6 - Bicycle Facilities		1
1			Credit	LTc7 - Reduced Parking Footprint		1
1			Credit	LTc8 - Green Vehicles		1

6	2	4	Sustainable Sites			12
Y			Prereq	SSp1 - Construction Activity Pollution Prevention		Required
Y			Prereq	SSp2 - Environmental Site Assessment		Required
1			Credit	SSc1 - Site Assessment		1
		2	Credit	SSc2 - Site Development – Protect or Restore Habitat		2
1			Credit	SSc3 - Open Space	v 4.1	1
2		1	Credit	SSc4 - Rainwater Management	v 4.1	3
	2		Credit	SSc5 - Heat Island Reduction		2
1			Credit	SSc6 - Light Pollution Reduction		1
		1	Credit	SSc7 - Site Master Plan		1
1			Credit	SSc8 - Joint Use of Facilities		1

6	0	6	Water Efficiency			12
Y			Prereq	WEp1 - Outdoor Water Use Reduction		Required
Y			Prereq	WEp2 - Indoor Water Use Reduction		Required
Y			Prereq	WEp3 - Building-Level Water Metering		Required
2			Credit	WEc1 - Outdoor Water Use Reduction		2
3		4	Credit	WEc2 - Indoor Water Use Reduction		7
		2	Credit	WEc3 - Cooling Tower Water Use		2
1			Credit	WEc4 - Water Metering		1

15	6	10	Energy and Atmosphere			31
Y			Prereq	EAp1 - Fundamental Commissioning & Verification		Required
Y			Prereq	EAp2 - Minimum Energy Performance		Required
Y			Prereq	EAp3 - Building-Level Energy Metering		Required
Y			Prereq	EAp4 - Fundamental Refrigerant Management		Required
5		1	Credit	EAc1 - Enhanced Commissioning		6
9	3	4	Credit	EAc2 - Optimize Energy Performance		16
	1		Credit	EAc3 - Advanced Energy Metering		1
	2		Credit	EAc4 - Demand Response		2
		3	Credit	EAc5 - Renewable Energy Production		3
1			Credit	EAc6 - Enhanced Refrigerant Management		1
		2	Credit	EAc7 - Green Power and Carbon Offsets		2

5	1	7	Materials and Resources			13
Y			Prereq	MRp1 - Storage & Collection of Recyclables		Required
Y			Prereq	MRp2 - Construction & Demolition Waste Management Planning		Required
	1	4	Credit	MRc1 - Building Life-Cycle Impact Reduction	v 4.1	5
1		1	Credit	MRc2 - Building Product Disclosure & Optimization – Environmental Product Declarations	v 4.1	2
1		1	Credit	MRc3 - Building Product Disclosure & Optimization – Sourcing of Raw Materials	v 4.1	2
1		1	Credit	MRc4 - Building Product Disclosure & Optimization – Material Ingredients	v 4.1	2
2			Credit	MRc5 - Construction & Demolition Waste Management		2

11	2	3	Indoor Environmental Quality			16
Y			Prereq	EQp1 - Minimum Indoor Air Quality Performance		Required
Y			Prereq	EQp2 - Environmental Tobacco Smoke Control	v 4.1	Required
Y			Prereq	EQp3 - Minimum Acoustic Performance		Required
2			Credit	EQc1 - Enhanced Indoor Air Quality Summary of Requirements		2
3			Credit	EQc2 - Low-Emitting Materials	v 4.1	3
1			Credit	EQc3 - Construction Indoor Air Quality Management Plan		1
2			Credit	EQc4 - Indoor Air Quality Assessment		2
1			Credit	EQc5 - Thermal Comfort		1
2			Credit	EQc6 - Interior Lighting		2
	2	1	Credit	EQc7 - Daylight	v 4.1	3
		1	Credit	EQc8 - Quality Views		1
		1	Credit	EQc9 - Acoustic Performance		1

6	0	0	Innovation			6
1			Credit	IN1.1 - Design for Active Occupants		1
1			Credit	IN 1.2 - Occupant Comfort Survey		1
1			Credit	IN 1.3 - Purchasing - Lamps		1
1			Credit	IN1.4 - PBT Source Reduction		1
1			Credit	IN1.5 - LEED O&M Starter kit (Green Cleaning and Pest Management)		1
1			Credit	LEED Accredited Professional		1

3	0	0	Regional Priority			4
1			Credit	Regional Priority: Reduced Parking Footprint		1
1			Credit	Regional Priority: Sensitive Land Protection		1
1			Credit	Regional Priority: Sourcing of Raw Materials		1
			Credit	Regional Priority		1

56	11	42	TOTALS			Possible Points: 110
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Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

SECTION 01 3329.01 - MATERIAL CONTENT FORM

PROJECT NAME: BLUE HERON ELEMENTARY SCHOOL; NO.: 18050.

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

PRODUCT CONTENT

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

2.4 EQ CREDIT 2: LOW EMITTING MATERIALS

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

2.5 INNOVATION: PBT SOURCE REDUCTION

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

EMISSIONS AND HEALTH

3.1 MR CREDIT 4: MATERIAL INGREDIENTS.

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

_____ Is Attached

_____ Is Not Available.

3.2 EQ CREDIT 2: COMPOSITE WOOD EVALUATION:

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

3.3 EQ CREDIT 2: GENERAL EMISSIONS EVALUATION:

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

3.4 EQ CREDIT 2: WET-APPLIED PRODUCTS:

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

CERTIFIED BY: (MANUFACTURER)

4.1 _____ DOCUMENTATION OF ALL CLAIMS MADE ABOVE IS ATTACHED.

COST CERTIFICATION: (CONTRACTOR)

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

5.2 NO. OF UNITS INSTALLED: _____

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

5.4 CERTIFIED BY: (CONTRACTOR)

PRINT NAME: _____

SIGNATURE: _____

TITLE: _____ (OFFICER OF COMPANY)

END OF SECTION

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.

3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- C. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- E. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering

services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.

2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.8 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

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

END OF SECTION

SECTION 01 4216 - DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4219 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Definitions
- B. Requirements relating to referenced standards.
- C. Reference standards full title.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.1 AA -- ALUMINUM ASSOCIATION, INC.

2.2 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.
- B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
- E. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- F. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
- G. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- H. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- I. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- J. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- K. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- L. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.

2.3 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.

2.4 AHA -- AMERICAN HARDBOARD ASSOCIATION

2.5 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

- A. AISC (MAN) - Steel Construction Manual.

- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- D. AISC 360 - Specification for Structural Steel Buildings.

2.6 AISI -- AMERICAN IRON AND STEEL INSTITUTE

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.

2.7 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices.

2.8 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE

- A. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification.
- B. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- C. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- D. 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.
- E. 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.
- F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
- G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.

- M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
- O. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
- P. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- Q. ANSI A135.4 - American National Standard for Basic Hardboard.
- R. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- S. ANSI A137.2 - American National Standard Specifications for Glass Tile.
- T. ANSI A208.1 - American National Standard for Particleboard.
- U. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
- V. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- W. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- X. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- Y. ANSI/ESD STM7.1 - Standard Test Method for the Protection of Electrostatic Discharge Susceptible Items - Floor Materials - Resistive Characterization of Materials.
- Z. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- AA. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems.

2.9 APA -- APA - THE ENGINEERED WOOD ASSOCIATION

2.10 ASCE -- AMERICAN SOCIETY OF CIVIL ENGINEERS

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

- A. ASHRAE Guideline 1.1 - The HVAC&R Technical Requirements for the Commissioning Process.
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

2.12 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

- A. ASME A17.1 - Safety Code for Elevators and Escalators.

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

2.13 ASTM A SERIES -- ASTM INTERNATIONAL

- A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- E. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- F. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- I. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- J. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- K. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- L. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- M. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
- N. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
- O. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- P. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- Q. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- R. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

- S. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- T. 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.
- U. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

2.14 ASTM B SERIES -- ASTM INTERNATIONAL

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- B. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- C. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric).
- D. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- E. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- H. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- I. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

2.15 ASTM C SERIES -- ASTM INTERNATIONAL

- A. ASTM C150/C150M - Standard Specification for Portland Cement.
- B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- F. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

- G. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- H. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- I. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- K. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- L. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- M. ASTM C834 - Standard Specification for Latex Sealants.
- N. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- O. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- P. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- Q. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- R. 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.
- S. ASTM C1036 - Standard Specification for Flat Glass.
- T. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- U. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- V. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- W. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- X. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- Y. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- Z. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- AA. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- AB. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

- AC. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- AD. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- AE. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- AF. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- AG. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

2.16 ASTM D SERIES -- ASTM INTERNATIONAL

- A. ASTM D523 - Standard Test Method for Specular Gloss.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- C. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- D. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- E. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.
- F. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- H. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- I. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- K. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
- L. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- M. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet.
- N. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- O. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

- P. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- Q. ASTM D4551 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane.
- R. ASTM D5149 - Standard Test Method for Ozone in the Atmosphere: Continuous Measurement by Ethylene Chemiluminescence.
- S. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- T. ASTM D5957 - Standard Guide for Flood Testing Horizontal Waterproofing Installations
- U. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

2.17 ASTM E SERIES -- ASTM INTERNATIONAL

- A. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- D. 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.
- E. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.
- F. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- G. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- H. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- I. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- J. ASTM E1186 - Standard Practices for Air Leakage Site detection in Building Envelopes and Air Barrier Systems
- K. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.
- L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- M. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- N. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

- O. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- P. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- Q. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- R. ASTM E2573 - Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics.

2.18 ASTM F SERIES -- ASTM INTERNATIONAL

- A. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- B. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- C. ASTM F594 - Standard Specification for Stainless Steel Nuts.
- D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- E. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.
- F. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- G. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- H. ASTM F1861 - Standard Specification for Resilient Wall Base.
- I. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- J. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.
- K. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
- L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

2.19 AWI -- ARCHITECTURAL WOODWORK INSTITUTE

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

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

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

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

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

2.22 AWWA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION

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

2.23 AWS -- AMERICAN WELDING SOCIETY

- A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- C. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

2.24 BHMA -- BUILDERS HARDWARE MANUFACTURERS ASSOCIATION

- A. BHMA A156.9 - American National Standard for Cabinet Hardware.
- B. BHMA A156.11 - Cabinets Locks
- C. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.

2.25 CAL -- STATE OF CALIFORNIA

- A. CAL Technical Bulletin 117 - Requirements, Test Procedure and Apparatus for Testing the Flame Resistance of Resilient Filling Materials Used in Upholstered Furniture
- B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.

2.26 CARB -- CALIFORNIA AIR RESOURCES BOARD

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

2.27 CDA -- COPPER DEVELOPMENT ASSOCIATION, INC.

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

2.28 DIN -- DEUTSCHES INSTITUT FUR NORMUNG

- A. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.
- B. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.

- C. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.
- D. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.

2.29 FM -- FACTORY MUTUAL GLOBAL

- A. FM 4991 - Approval Standard for Firestop Contractors.

2.30 GA -- GYPSUM ASSOCIATION

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

2.31 GREENSEAL -- GREEN SEAL, INC.

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

2.32 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION

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

2.33 IAS -- INTERNATIONAL ACCREDITATION SERVICE

- A. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.

2.34 ICC -- INTERNATIONAL CODE COUNCIL, INC.

- A. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- B. ICC (IBC) - International Building Code.

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

- A. ICC-ES AC24 - Interim Criteria for Exterior Insulation and Finish Systems
- B. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- C. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

2.36 ICRI -- INTERNATIONAL CONCRETE REPAIR INSTITUTE

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

2.37 ISFA - INTERNATIONAL SURFACE FABRICATORS ASSOCIATION

- A. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- B. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.

2.38 ITS -- INTERTEK TESTING SERVICES NA, INC.

- A. ITS (DIR) - Directory of Listed Products.

2.39 MIA -- MARBLE INSTITUTE OF AMERICA, INC.

- A. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII.

2.40 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

- A. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.
- B. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- C. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- D. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- E. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- F. NAAMM AMP 510 - Metal Stairs Manual.
- G. NAAMM (MFPM) - Metal Flagpole Manual.

2.41 NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

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

2.42 NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION

- A. NFPA 10 - Standard for Portable Fire Extinguishers.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- D. NFPA 101 - Life Safety Code.
- E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- G. NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
- H. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

- I. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- 2.43 NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION
 - A. NRCA (RM) - The NRCA Roofing Manual.
 - B. NRCA (WM) - The NRCA Waterproofing Manual.
- 2.44 NTMA -- NATIONAL TERRAZZO AND MOSAIC ASSOCIATION, INC., THE
 - A. NTMA (COLOR) - Terrazzo Color Palettes.
 - B. NTMA (GRAD) - Aggregate Gradation Standards.
 - C. NTMA (EPOXY) - Epoxy Terrazzo Specifications.
- 2.45 NWWDA -- NATIONAL WOOD WINDOW AND DOOR ASSOCIATION (NAME CHANGED TO WDMA)
- 2.46 PECI - PORTLAND ENERGY CONSERVATION, INC.
 - A. PECI (MCP) - Model Commissioning Plan.
- 2.47 SCAQMD -- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
 - A. SCAQMD 1113 - Architectural Coatings.
 - B. SCAQMD 1168 - Adhesive and Sealant Applications.
- 2.48 SDI -- STEEL DOOR INSTITUTE
 - A. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- 2.49 SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.
 - A. SMACNA (ASMM) - Architectural Sheet Metal Manual.
 - B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.
- 2.50 SPIB -- SOUTHERN PINE INSPECTION BUREAU, INC.
 - A. SPIB (GR) - Grading Rules.
- 2.51 SSPC -- SOCIETY FOR PROTECTIVE COATINGS
 - A. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
 - B. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel.
 - C. SSPC-SP 1 - Solvent Cleaning.
 - D. SSPC-SP 2 - Hand Tool Cleaning.
 - E. SSPC-SP 3 - Power Tool Cleaning.

F. SSPC-SP 6 - Commercial Blast Cleaning.

2.52 TCNA -- TILE COUNCIL OF NORTH AMERICA, INC.

A. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

2.53 UL -- UNDERWRITERS LABORATORIES INC.

A. UL (DIR) - Online Certifications Directory.

B. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

C. UL 263 - Standard for Fire Tests of Building Construction and Materials.

D. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

E. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings.

F. UL 879 - Electric Sign Components.

G. UL 1479 - Standard for Fire Tests of Penetration Firestops.

H. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

2.54 USGBC -- U. S. GREEN BUILDING COUNCIL

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

2.55 WCMA -- WINDOW COVERING MANUFACTURERS ASSOCIATION

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

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

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

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.1 CFR -- CODE OF FEDERAL REGULATIONS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.

B. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

3.2 PS -- PRODUCT STANDARDS

A. PS 1 - Structural Plywood.

B. PS 2 - Performance Standard for Wood-Based Structural-Use Panels.

C. PS 20 - American Softwood Lumber Standard.

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. General Scope of Work for Bid Package (All Trades)

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is not available. Temporary Power to be provided per Scope of Work Bid Package
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is not available. Temporary Power to be provided per Scope of Work Bid Package.

1.3 INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Projects site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 15 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Provide per Scope of Work Bid Package.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's emergency after-hours telephone number.
 - d. Architect's office.
 - e. Owner's office.
 - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
 2. Provide truck wheel wash station at locations designated by Construction Manager with adequate temporary drainage facilities. Furnish, maintain, and remove a wash rack system of such design and capacity that the completed system prevents sediment from leaving the site. Wash rack system will remain in place and fully operational until school parking lots are base coated unless otherwise directed by the Construction Manager. Contractor shall provide Wash racks for all temporary road entrances. Wash rack system shall be such that it can be maintained on a daily basis including removal of the collected sediment. Submit a proposed design for review prior to installing the system. Provide as a part of the wash rack system two (2) adequately sized pressure washers and an operator who will be present during all working hours to clean sediment from all vehicles leaving the site regardless of who owns the vehicle. Provide all water, power, equipment, etc. for a complete working system.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install Subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Construction Sign for State Funding.
 - a. Location: Coordinate location with Construction Manager.
 - b. Size: 6' x 8'
 - c. Graphics and Language: Refer to image at end of the section.
 2. Sign for Baltimore County Public Schools.
 - a. Location: Coordinate location with Construction Manager.
 - b. Size: 4' x 8'
 - c. Graphics and Language: Refer to image at end of the section.
 3. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 4. Maintain and touchup signs so they are legible at all times.

- H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Temporary Elevator Use: See Division 14 Sections for temporary use of new elevators.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 - 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required by the Scope/Logistics Plan to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
 - 1. Construct covered walkways using scaffold or shoring framing.
 - 2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use permanent HVAC system to control humidity.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 01 5721 - INDOOR AIR QUALITY MANAGEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 PROJECT GOALS

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

1.3 REFERENCE STANDARDS

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

1.4 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.5 SUBMITTALS

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

1.6 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Air Filtration Media
 - 1. Temporary filtration media: Filtration media rated for minimum efficiency reporting value (MERV) of 8 minimum, when tested in accordance with ASHRAE 52.2-2007.
 - a. Alternative Compliance Path: Provide Class F5 or higher filtration media, in accordance with CEN Standard EN 779-2002.
 - 2. Permanent filtration media for each ventilation system that supplies outdoor air to occupied spaces: Filtration media rated for minimum efficiency reporting value (MERV) of 13 minimum when tested in accordance with ASHRAE 52.2-2007.

- a. Alternative Compliance Path: Provide Class F7 or higher filtration media, in accordance with CEN Standard EN 779-2002.

PART 3 EXECUTION

3.1 GENERAL

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

3.2 HVAC PROTECTION

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

3.3 SOURCE CONTROL

- A. Prohibit smoking (including use of electronic cigarettes) within the building and within 25 feet (2.5 meters) of building entrances, operable windows, or outdoor-air intakes.
- B. Limit use of fossil-fueled temporary heating units to propane-powered only inside the building and near building entrances, windows and intakes and within 25 feet of building entrances, operable windows, or outdoor-air intakes.
- C. Provide direct exhaust to the exterior during use of fossil-fueled temporary heating units and installation of strong emitting materials, including touch-up activities.

1. Keep exhaust away from intakes and occupied spaces.
- D. Protect “absorptive” or dry sink materials from exposure to dust, debris and moisture contamination during product delivery, storage and handling from construction, demolition and punch-out activities.
- E. Provide adequate ventilation of packaged dry products prior to installation.
- F. Prohibit “bake-out” or “super-heating” of spaces to accelerate the release of gaseous emissions.

3.4 PATHWAY INTERRUPTION

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

3.5 HOUSEKEEPING

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

3.6 SCHEDULING

- A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.
- B. Schedule for storage, installation, and protection of all components of air distribution systems.
- C. Schedule for storage, installation, and protection of absorptive materials (woven, fibrous or porous, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short-term release of off-gassing volatile organic compounds.

1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as dust, debris, moisture, gaseous and microbial contamination.
 2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.
- D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.

3.7 INDOOR AIR QUALITY ASSESSMENT

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

END OF SECTION

SECTION 01 5721 - INDOOR AIR QUALITY MANAGEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 PROJECT GOALS

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

1.3 REFERENCE STANDARDS

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

1.4 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.5 SUBMITTALS

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

1.6 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Air Filtration Media
 - 1. Temporary filtration media: Filtration media rated for minimum efficiency reporting value (MERV) of 8 minimum, when tested in accordance with ASHRAE 52.2-2007.
 - a. Alternative Compliance Path: Provide Class F5 or higher filtration media, in accordance with CEN Standard EN 779-2002.
 - 2. Permanent filtration media for each ventilation system that supplies outdoor air to occupied spaces: Filtration media rated for minimum efficiency reporting value (MERV) of 13 minimum when tested in accordance with ASHRAE 52.2-2007.

- a. Alternative Compliance Path: Provide Class F7 or higher filtration media, in accordance with CEN Standard EN 779-2002.

PART 3 EXECUTION

3.1 GENERAL

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

3.2 HVAC PROTECTION

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

3.3 SOURCE CONTROL

- A. Prohibit smoking (including use of electronic cigarettes) within the building and within 25 feet (2.5 meters) of building entrances, operable windows, or outdoor-air intakes.
- B. Limit use of fossil-fueled temporary heating units to propane-powered only inside the building and near building entrances, windows and intakes and within 25 feet of building entrances, operable windows, or outdoor-air intakes.
- C. Provide direct exhaust to the exterior during use of fossil-fueled temporary heating units and installation of strong emitting materials, including touch-up activities.

1. Keep exhaust away from intakes and occupied spaces.
- D. Protect “absorptive” or dry sink materials from exposure to dust, debris and moisture contamination during product delivery, storage and handling from construction, demolition and punch-out activities.
- E. Provide adequate ventilation of packaged dry products prior to installation.
- F. Prohibit “bake-out” or “super-heating” of spaces to accelerate the release of gaseous emissions.

3.4 PATHWAY INTERRUPTION

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

3.5 HOUSEKEEPING

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

3.6 SCHEDULING

- A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.
- B. Schedule for storage, installation, and protection of all components of air distribution systems.
- C. Schedule for storage, installation, and protection of absorptive materials (woven, fibrous or porous, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short-term release of off-gassing volatile organic compounds.

1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as dust, debris, moisture, gaseous and microbial contamination.
 2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.
- D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.

3.7 INDOOR AIR QUALITY ASSESSMENT

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

END OF SECTION

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

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 DEFINITIONS

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

1.3 REFERENCE STANDARDS

- A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.2, 2017.
- B. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board.
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- D. GreenSeal GS-36 - Adhesives for Commercial Use.
- E. SCAQMD 1113 - Architectural Coatings.
- F. SCAQMD 1168 - Adhesive and Sealant Applications.

1.4 SUBMITTALS

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

PART 2 PRODUCTS

2.1 MATERIALS

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

2.2 LOW-EMITTING MATERIALS

- A. VOC Emissions Evaluation: Provide the following materials compliant with emissions testing in accordance with California Department of Public Health (CDPH) Standard Method v2.1-2017, using the applicable exposure scenario. The default scenario is the private office scenario.
 - 1. Paints and coatings wet-applied within the building interior: Provide at least 75 percent of products in compliance (by volume or surface area).
 - 2. Wall Panels (gypsum board, plaster, wall covering, wall paneling, cubicle curtain, partition wall, doors, window treatments): Provide at least 75 percent in compliance (by material cost or surface area).
 - 3. Flooring installed within building interior. At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.
 - 4. Ceilings (ceiling panel, ceiling tile, gypsum board, plaster, suspended canopy and cloud): Provide at least 90 percent in compliance (by material cost or surface area).

5. Insulation installed within the building interior (thermal and acoustic boards, batts, rolls, blankets, sound attenuation, fire blankets, foamed-in-place, loose-fill, blown, and sprayed): Provide at least 75 percent in compliance (by material cost or surface area).
- B. Composite wood permanently installed within the building interior: Provide at least 75 percent (by material cost or surface area) in compliance with the California Air Resources Board (CARB), Airborne Toxic Control Measure (ATCM), Phase II, for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde (NAF) resins.
1. Exemption: Salvaged and reused architectural millwork more than one year old.
 2. Exemption: Plywood made with phenol formaldehyde.
 3. Exemption: Structural wood products made with moisture resistant adhesives meeting ASTM 2559, having no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following.
 - a. Plywood: Voluntary Product Standard - Structural Plywood (PS 1-09), Voluntary Product Standard - Performance Standard for Wood-Based Structural Use Panels (PS 2-10), or CARB equivalent to PS 1 or PS 2.
 - b. Oriented Strand Board (OSB): Exposure 1 or Exterior Bond according to Voluntary Product Standard - Performance Standard for Wood-Based Structural Use Panels (PS 2-10).
 - c. Structural Composite Lumber: Structural Glued Laminated Timber (ANSI A190.1-2012).
 - d. I-Joists: Standard Specification Establishing and Monitoring Structural Capacities of Pre-Fabricated Wood I-Joists (ASTM D 5055-13).
 - e. Cross-Laminated Timber: Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15).
 - f. Finger-Jointed Lumber: Labeled "Heat Resistant Adhesive (HRA)" according to American Softwood Lumber Standard (DOC PS-20 2015).
- C. Adhesives wet-applied within the building interior: Comply with VOC content limits below, as expressed in grams per Liter, less water and exempt compounds, of South Coast Air Quality Management District (SCAQMD) Rule 1168 "Adhesive and Sealant Applications," October 6, 2017, or more stringent levels.
1. Indoor Carpet & Pad Adhesives: 50
 2. Wood Flooring Adhesive: 100
 3. Rubber Floor Adhesives: 60
 4. Subfloor Adhesives: 50
 5. Ceramic Tile Adhesives: 65
 6. VCT and Asphalt Tile (& Linoleum) Adhesives: 50
 7. Dry Wall and Panel Adhesives: 50
 8. Cove Base Adhesives: 50
 9. Multipurpose Construction Adhesives: 70
 10. Structural Glazing Adhesives: 100
 11. PVC Welding: 510
 12. CPVC Welding: 490
 13. ABS Welding: 325
 14. Plastic Cement Welding: 250
 15. Adhesive Primer for Plastic: 550
 16. Contact Adhesive: 80
 17. Special Purpose Contact Adhesive: 250
 18. Structural Wood Member Adhesive: 140
 19. Metal to metal substrates: 30
 20. Plastic foam substrate: 50

21. Porous substrate except wood: 50
 22. Wood substrate: 30
 23. Fiberglass substrate: 80
 24. All Other Welding & Installation Adhesives: 250
- D. Paints and coatings wet-applied within building interior: Comply with the following VOC content limits as expressed in grams per Liter, less water and exempt compounds, of California Air Resources Board (CARB) 2007, Suggested Control Measures (SCM) for Architectural Coatings, or SCAQMD Rule #1113 "Architectural Coatings," February 5, 2016.
1. Flat Paint or Coating: 50
 2. Non-flat Paint or Coating: 50
 3. Non-flat - High Gloss Coating: 50
 4. Basement Specialty Coatings: 400
 5. Clear Wood Finishes, Varnish: 275
 6. Clear Wood Finishes, Sanding Sealer: 275
 7. Clear Wood Finishes, Lacquer Sealer: 275
 8. Clear Brushing Lacquer: 275
 9. Concrete Curing Compound: 100
 10. Concrete/Masonry Sealers: 100
 11. Dry-fog Coatings: 50
 12. Fire Resistive Coatings: 150
 13. Floor Coatings: 50
 14. Form-Release Compounds: 100
 15. Graphic Arts (sign) Coatings: 200
 16. High Temperature Coatings: 420
 17. Industrial Maintenance Coatings: 100
 18. Japanese/ Faux Finish Coatings: 350
 19. Low-Solids Coating: 120
 20. Mastic Coatings: 100
 21. Metallic Pigmented Coatings: 150
 22. Multicolor Coatings: 250
 23. Pretreatment Wash Primers: 420
 24. Primers, Sealers and Undercoaters: 100
 25. Reactive Penetrating Sealers: 350
 26. Recycled Coatings: 250
 27. Rust Preventative Coatings: 100
 28. Shellac, Clear: 730
 29. Shellac, Pigmented: 550
 30. Specialty Primers, Sealers, and Undercoaters: 100
 31. Stains: 100
 32. Stone Consolidants: 450
 33. Traffic Coatings: 100
 34. Tub and Tile Refinish Coatings: 420
 35. Waterproofing Sealer: 100
 36. Waterproofing Concrete, Masonry Sealers: 100
 37. Wood Coatings: 275
 38. Wood Preservatives: 350
 39. Zinc Rich Primers: 100
- E. Inherently non-emitting sources (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) that do not include integral organic-based surface coatings, binders, or sealants: Exempt from low-emitting materials requirements.

- F. Methylene chloride and perchloroethylene: Prohibited in paints, coatings, adhesives, or sealants.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

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

END OF SECTION

SECTION 01 7123 – FIELD ENGINEERING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Requirements of the General Provisions apply to all work under this section.
- B. Frederick County Division of Utilities and Solid Waste Management – general conditions and specifications for water mains, sanitary sewer and related structures dated January 1, 2015 and as amended.
- C. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Architect for consideration. Those judged to be equal to that specified will receive written approval.

1.2 SUMMARY

Work included: Provided at the Contractor's expense, such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:

- A. The Contractor shall have property lines located and marked and corners set by a certified land surveyor. Permanent corner markers shall be installed where they do not already exist.
- B. The Contractor shall be responsible for all stakeouts and elevation checks required for construction. All such Work shall be performed by a professional land surveyor. The surveyor shall verify adequacy of benchmarks before starting construction.
- C. Before the start of any building construction, the Contractor shall have a professional land surveyor locate and stake building corners, driveway entrances, driveways, parking areas and playfields. If there are any discrepancies between the actual layout and the project site plan, they shall be brought to the attention of the Architect and resolved before Work proceeds. A building and site stake out drawing stamped and signed by a professional land surveyor may be submitted in lieu of this preliminary stake out.
- D. After the corners of the exterior walls have been started, the Contractor shall obtain a wall check survey certificate made by a professional land surveyor. This survey shall show the accurate location of the building with reference to property lines.
- E. After the first sections of slab-on-grade have been placed in the school building, the Contractor shall have a professional land surveyor verify and record the finish floor elevation on the wall check survey.
- F. At the end of the project, the Contractor shall have a professional land surveyor prepare an as-built survey showing the accurate horizontal and vertical locations of all building corners, paved areas, sidewalks, utilities, fencing, site walls stormwater management facilities in accordance with the requirements of Frederick County, etc. located within the project area.

1.3 RELATED WORK:

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

1.4 QUALITY ASSURANCE

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

1.5 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300-Submittals.
- B. Upon request of the Architect, submit;
 - 1. Data demonstrating qualifications of persons proposed to be engaged for field Engineering services.
 - 2. Documentation verifying accuracy of field engineering work.
 - 3. Certifications, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance with requirements of the Contract Documents.

1.6 PROCEDURES

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

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END SECTION

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

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

1.2 REFERENCES

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

1.3 PRELIMINARY SUBMITTALS

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

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

1.4 INFORMATIONAL SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

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

1. Provide adequate space, convenient to subcontractors, for pick-up and delivery.
 2. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.
- C. Records: Maintain on-site logs for each load of materials removed from site:
1. Include type of material, load (by weight or volume), recycling/hauling service, and date accepted by service or non-profit receiver.
 - a. Comingling waste as a single stream: provide documentation of percentages of diverted waste from the sorting facility for the corresponding month.
 - b. 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.
- 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 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.
- D. LEED Closeout Submittals: A Log Binder to include:
 - 1. Waste Management Plan.
 - 2. Salvaged, refurbished, reused materials log.
 - 3. Recycled materials content log/data.
 - 4. Regional materials log/data.
 - 5. FSC wood products log/data.
 - 6. IAQ Management Plan and supporting documentation as required by IAQ Management Plan.
 - 7. Other requirements as needed.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager 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.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager 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.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
 1. Organize list of spaces in sequential order, starting with exterior areas first.
 2. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.
 3. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

- g. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - h. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

1.2 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

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

END OF SECTION

SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

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

1.2 GENERAL DESCRIPTION

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

1.3 SCOPE

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

1.4 RELATED WORK AND DOCUMENTS

- A. Commissioning Plan (Cx Plan): The Cx Plan shall be available for reference as it outlines responsibilities outside of the Construction Contract. It gives the Contractor a perspective as to the overall process. It encompasses the entire commissioning process including design phase and post-construction tasks.
- B. Section 01 4000 – Quality Control: Specifies the contractor’s requirements and responsibilities for testing and re-testing.
- C. Section 01 3300 – Submittals: Addresses documentation and procedures relative to the commissioning process, including Operation and Maintenance Manuals.
- D. Section 01 5000 – 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 7700 – Project Close Out: Defines the milestones in completion incorporating the commissioning process.
- F. Section 01 8113 – Sustainable Design Requirements: Provides LEED™ requirements for the project delivery.
- G. Section 01 9115 – Functional Performance Testing Procedures: Provides ‘generic’ functional performance testing procedures to illustrate the level-of-effort expected during acceptance testing.
- H. Individual Specification Sections: Individual sections stipulate installation, startup, warranty, O&M documentation, and training requirements for the system or device specified in the Section.
- I. Section 23 0859 – Building Automation Systems Commissioning: Details the commissioning procedures specific to the Building Automation System.

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

1.5 DEFINITIONS AND ABBREVIATIONS

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

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

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

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

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

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

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

1.6 REFERENCE STANDARDS

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

1.7 DOCUMENTATION

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

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

1.8 COMMISSIONING SEQUENCING AND SCHEDULING

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

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

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

1.9 ELECTRONIC RECORD SUBMITTALS

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

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

1.10 COORDINATION MANAGEMENT PROTOCOLS

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

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

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

1.11 CONTRACTOR RESPONSIBILITIES

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

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

1.12 EQUIPMENT SUPPLIER/VENDOR RESPONSIBILITIES

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

1.13 COMMISSIONING KICK OFF / COORDINATION MEETING

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

1.14 STARTUP PROCEDURES AND DOCUMENTATION

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

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

1.15 FUNCTIONAL PERFORMANCE TESTING

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

1.16 DEFICIENCIES IDENTIFIED DURING FUNCTIONAL TESTING

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

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

1.17 TRAINING EVENTS

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

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

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

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

H. Final Systems Operation Training

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

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

1.18 SYSTEMS MANUAL PREPARATION AND LOGISTICS

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

1.19 SYSTEMS MANUAL CONTENT AND ORGANIZATION

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

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

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

B. Manual Section 2 - Primary Systems Operating Information

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

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

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

C. Manual Section 3 - Maintenance Manual

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

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

D. Manual Section 4 – Ongoing Commissioning Plan

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

1.20 TEMPORARY CONDITIONING

A. Contractor shall only use building permanent equipment to provide temporary conditioning with the prior approval of Owner. Approval for such use will only be given upon acceptance of a detailed plan provided by the individually involved subcontractors and compiled by the CM. The temporary conditioning plan shall consider/address the following at a minimum.

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

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

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

1.21 PHASING PLAN

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

PART 2 PRODUCTS

2.01 INSTRUMENTATION

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

2.02 TEST KITS FOR METERS AND GAGES

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

PART 3 EXECUTION

3.01 Functional performance Test Execution

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

END OF SECTION

SECTION 01 9114 - COMMISSIONING AUTHORITY RESPONSIBILITIES

PART 1 GENERAL

1.1 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section covers the Commissioning Authority's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests performed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed O&M data submittals are specified.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is specified.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. Coordinate and direct all the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

1.2 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - The HVAC&R Technical Requirements for the Commissioning Process.
- B. PEI (MCP) - Model Commissioning Plan.

1.4 SUBMITTALS

- A. Commissioning Plan:
 - 1. Submit preliminary draft for review by Owner and Architect within 30 days after commencement of Commissioning Authority contract.
 - 2. Submit revised draft to be included in the construction contract documents, not less than 4 weeks prior to bid date.
 - 3. Submit final plan not more than 90 days after commencement of construction, for issuance to all parties.
- B. List of Prefunctional Checklists to be developed:

1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 3. Submit final list not more than 60 days after start of construction.
- C. Prefunctional Checklists:
1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised draft for review by Owner and Architect not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.
- D. List of Functional Test procedures to be developed:
1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in the Contract Documents; this is intended to be a list of titles, not full description of the tests.
 3. Submit final list not more than 60 days after start of construction.
- E. Functional Test Procedures:
1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 2. Submit revised draft for review by Owner and Architect not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.
- F. Training Plan.
- G. Recommissioning Manual: Submit within 60 days after receipt of Owner's instructions to proceed with preparation.
- H. Commissioning Record: Submit to Contractor for inclusion with O&M manuals.
- I. Final Commissioning Report: Submit to Owner.

PART 3 EXECUTION

2.1 COMMISSIONING PLAN

- A. Prepare and maintain the Commissioning Plan, covering commissioning schedule, Prefunctional Checklist and Functional Test procedures, coordination requirements, and forms to be used, for all parties in the commissioning process.
1. Call and chair meetings of the Commissioning Team when appropriate.
 2. Give Contractor sufficient notice for scheduling commissioning activities.
 3. Develop a comprehensive start-up and initial systems checkout plan with cooperation of Contractor and subcontractors.
 4. PEI (MCP) may be used as a guide for the Commissioning Plan.
 5. ASHRAE Guideline 1.1 may be used as a guide for the Commissioning Plan.
 6. Avoid replication of information included in the construction contract documents to the greatest extent possible.

- B. Review the construction contract documents for Contractor submittals of draft checklists, draft test procedures, manufacturer startup procedures, and other information intended for the use of the Commissioning Authority in preparing the Commissioning Plan.
- C. Commissioning Schedule:
 - 1. Coordinate with Contractor anticipated dates of startup of each item of equipment and system.
 - 2. Contractor's scheduling responsibilities are specified in the construction contract documents.
 - 3. Revise and re-issue schedule monthly.
 - 4. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 - 5. Deliver relevant Prefunctional Checklists and Functional Test Procedures to Contractor in time to avoid delay.

2.2 CONSTRUCTION CONTRACT DOCUMENTS

- A. General Commissioning Specifications: Architect has prepared general commissioning specifications for inclusion in the construction contract documents; review and submit comments to Owner.
 - 1. These specifications include:
 - a. Procedures applicable to all types of items to be commissioned.
 - 2. Prepare specifications for any of the following that would be recommended, for incorporation into the construction contract documents by Architect:
 - a. Additional Contractor submittals needed for purposes of commissioning, such as startup procedures, draft test procedures, draft training plans, etc.
 - b. Additional Owner personnel training.
 - c. Additional operation or maintenance data that should be submitted.
- B. Prefunctional Checklists: Develop detailed Checklists for each item to be commissioned.
 - 1. List of Checklists to be Developed: Prepare and maintain a detailed list of titles, not full text.
 - 2. The Checklist forms are intended to be part of the Contractor's Contract Documents.
- C. Functional Testing: Develop detailed procedures for each item to be commissioned; submit for review by Owner and Architect.
 - 1. List of Test Procedures to be Developed: Prepare and maintain a detailed list of titles, not full text.
 - 2. The forms the Commissioning Authority will use to report Functional Test results are not intended to be part of Contractor's Contract Documents, but the Functional Test Procedures that must be executed by the Contractor must be made part of the Contract Documents, by modification if necessary.
- D. Develop any other reporting forms Contractor will be required to use; if they are likely to require a substantially different amount of work than the Contractor can reasonably anticipate, they must be included in the construction contract documents.
- E. If any part of the documents described above have not been developed by the bid date, coordinate with Architect the issuance of modifications to the construction contract documents

2.3 PREFUNCTIONAL CHECKLISTS

- A. Prefunctional Checklists - Content: Prepare forms for Contractor's use, in sufficient detail to document that the work has been installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup.
1. Prepare separate Checklists for each type of equipment, system, or other assembly, customized to the item.
 2. Identify each Checklist by using the contract documents identification number or name, if any; if none, create unique identifiers for each Checklist; do not rely on Contractor to number checklists.
 3. Multiple identical or near-identical items may appear on a single Checklist provided there is space to record all required data for each separately; label each set of data uniquely.
 4. Include space to record manufacturer name, model number, serial number, capacity and other relevant characteristics, and accessories and other features as applicable; include space to record "as specified", "as submitted", and "as installed" data.
 5. Include space to record whether or not the required submittals have been received; list each separate type of submittal.
 6. Include line items for each physical inspection to be performed.
 7. Include line items for each operational inspection to be performed, such as checking switch operation, fan rotation, valve and damper stroke, and measuring actual electrical loads.
 8. Include separate section for sensors and actuators, with space for documenting actual physical location and calibration measurements; provide a separate generic calibration checklist identified wherever referenced.
 9. Include spaces to record that related Checklists for related work upon which this work depends have been completed.
- B. Prefunctional Checklists - Format:
1. Provide a cover sheet showing name of equipment item or system, documentation identification number (see Documentation Identification Scheme), names of accessory components involved, and identification of related checklists.
 2. Include on cover sheet space for Contractor's use in attesting to completeness; provide spaces for the signatures of the general contractor and each subcontractor or other entity responsible, customized to the project and the type of item.
 3. Include on the cover sheet, above the signature block, the following statement: "The work referenced in this Checklist and other work integral to or dependent on this work is complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event." Include two checkboxes:
 - a. "This Checklist is submitted for approval with no exceptions."
 - b. "This Checklist is submitted for approval, subject to the attached list of outstanding items, none of which preclude the performance of safe and reliable functional tests. A statement of completion will be submitted upon completion of the outstanding items."
 4. Use a consistent, tabular format for all Checklists, with one line per checklist activity.
 5. For each line item, provide space for initials and date, and identification of the subcontractor or other entity responsible.

2.4 FUNCTIONAL TEST PROCEDURES

- A. Develop test procedures in sufficient detail to show that functional performance is in accordance with the Contract Documents and shows proper operation through all modes of

operation where there is a different system response, including seasonal, unoccupied, warm-up, cool-down, part- and full-load.

1. Obtain assistance and review by installing subcontractors.
 2. Itemize each test sequence in step-by-step order, with acceptance criteria for each step and for the test as a whole.
 3. Include test setup instructions, description of tools and apparatus, special cautions, and.
 4. Avoid procedures that would void or otherwise limit warranties; review with Contractor prior to execution.
 5. For HVAC systems, procedures may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
 6. Obtain explicit approval of Contractor in regard to feasibility and safety prior to execution.
- B. Functional Test Report Forms: Prepare forms in advance of testing, using a consistent format; include all test procedure information given to Contractor and:
1. Report Identifier (see Documentation Identification Scheme).
 2. Test prerequisites.
 3. Formulas to be used in calculations.
 4. Yes/No check boxes for each step of test.
 5. Space to record results, document deficiencies, and make recommendations.
 6. Signature and date block for Commissioning Authority.
- C. Functional Test Prerequisites: Include space to verify all of the following items on each Functional Test Report Form, unless truly inapplicable:
1. All related equipment has been started up and start-up reports and Prefunctional Checklists submitted and approved ready for Functional Testing.
 - a. For hydronic systems, check that:
 - 1) Piping system flushing is complete and required report approved.
 - 2) Water treatment system is complete and operational.
 - 3) Test and balance (TAB) is complete and approved.
 2. All control system functions for this and all interlocking systems are programmed and operable in accordance with the Contract Documents, including final set points and schedules with debugging, loop tuning and sensor calibrations completed, with space for signature of controls installer.
 3. Incomplete items identified by Architect during closeout inspections have been corrected or completed.
 4. Safeties and operating ranges have been reviewed.
 5. A copy of the specified sequence of operation is attached.
 6. A copy of applicable schedules and setpoints is attached.
 7. A copy of the specified Functional Test Procedures is attached.
 8. The Functional Test Procedures have been reviewed and approved by the applicable installer.
 9. Vibration control report approved (if required).
 10. False loading equipment, system and procedures ready.
 11. Sufficient clearance around equipment for servicing.
 12. Original values of pre-test setpoints that need to be changed to accommodate testing have been recorded, with a check box provided to verify return to original values (include control parameters, limits, delays, lockouts, schedules, etc.).
 13. Any other items on the Prefunctional Checklist or Start-up Reports that need to be re-verified.

2.5 CONSTRUCTION PHASE

- A. Coordinate the commissioning work with Contractor and Construction Manager, ensure that commissioning activities are being incorporated into the master schedule.

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- B. Perform site visits, as necessary, to observe component and system installations. Attend planning and job-site meetings to obtain information on construction progress. Review Contractor's meeting minutes for issues relating to the commissioning process. Assist in resolving discrepancies.
- C. Commissioning Kick-Off Meeting: Plan and conduct a meeting early in the construction phase to review commissioning activities and responsibilities with all parties involved. Require attendance by all members of the Commissioning Team.
- D. Conduct periodic meetings as necessary to coordinate, resolve planning issues, and aid in resolution of deficiencies, minimizing the time spent by Contractor and Owner personnel; hold meetings at least monthly.
- E. Submit periodic progress reports to Owner and Contractor.
- F. Review Contractor shop drawing submittals applicable to systems being commissioned for compliance with commissioning needs; verify that Owner's responsibilities are clearly defined in warranties.
- G. Review and approve submittals directly related to commissioning.
- H. Deliver Prefunctional Checklists and Functional Test procedures to Contractor.
- I. Verify satisfactory completion of Prefunctional Checklists by Contractor by reviewing checklists and by site observation and spot checking; provide formal approval when satisfactory.
- J. Verify startup of all systems by reviewing start-up reports and by site observation; provide formal approval when satisfactory.
- K. Coordinate, witness and approve Functional Tests performed by Contractor. Coordinate retesting until satisfactory performance is achieved.
- L. HVAC Commissioning:
 - 1. Gather and review the control sequences and interlocks and work with Contractor and design engineers until sufficient clarity has been obtained, in writing, to be able to prepare detailed Functional Test procedures.
 - 2. Witness all or part of HVAC piping test and flushing procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
 - 3. Witness all or part of duct testing and cleaning procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
 - 4. Review TAB Plan prepared by Contractor.
 - 5. Before TAB is executed, witness sufficient Functional Testing of the control system to approve it to be used for TAB.
 - 6. Verify air and water systems balancing by spot testing, by reviewing completed reports, and by site observation; provide formal approval when satisfactory.
 - 7. Analyze trend logs and monitoring data to verify performance.
- M. Witness and document testing of systems and components over which the Commissioning Authority does not have direct control, such as smoke control systems, tests contracted directly by Owner, and tests by manufacturer's personnel; include documentation in O&M manuals.

- N. When Functional Testing for specific systems or equipment is specified to be performed by the Commissioning Authority rather than the Contractor, perform such testing without assistance of Contractor.
- O. Maintain a master deficiency and resolution log and a separate testing record. Provide written progress and test reports with recommended actions.
- P. O&M Data: Review submitted operation and maintenance data for completeness; provide formal approval if satisfactory.
- Q. Notify Contractor and Owner of deficiencies in procedures or results; suggest solutions.

2.6 TRAINING

- A. Training Plan: Prepare a comprehensive Training Plan, incorporating draft training plans submitted by Contractor.
 - 1. Include a ____ hour session by the HVAC design engineer covering the overall HVAC system and equipment design concepts, with one-line schematic drawings.
 - 2. Include a ____ hour session by the Commissioning Authority on the use of the blank Prefunctional Checklists and Functional Test report forms for re-commissioning purposes.
 - 3. Establish criteria for determining satisfactory completion of training.
- B. Verify that training was satisfactorily completed; provide formal approval if satisfactory.

2.7 CLOSEOUT

- A. Commissioning Record: Use the same format and organization as specified for the O&M manuals.
 - 1. Include the Final Commissioning Plan and Final Report.
 - 2. For each product or system and equipment item, include the following organized as indicated, with separator tabs:
 - a. Design intent documentation, furnished by Architect or others.
 - b. Detailed operational sequences.
 - c. Startup plan and approved startup reports.
 - d. Filled out Prefunctional Checklists.
 - e. Filled out Functional Test reports; trend logs and monitoring reports and analysis; other verification documentation.
 - f. Training plan and training records.
 - g. Recommissioning recommendations, including time schedule and procedures; include blank copies of all Prefunctional Checklists and Functional Test report forms.
- B. Final Commissioning Report: Include:
 - 1. Executive summary.
 - 2. List of participants and roles.
 - 3. Brief facility description.
 - 4. Overview of commissioning scope and general description of testing and verification methods.
 - 5. For each item commissioned, an evaluation of adequacy of:
 - a. The product itself; i.e. compliance with the contract documents.
 - b. Installation.
 - c. Functional performance; include a brief description of the verification method used and observations and conclusions from the testing.
 - d. O&M documentation, including design intent.

- e. Operator training.
 - 6. List of all outstanding non-compliance items, referenced to the specific functional test, inspection, trend log, etc., where the deficiency is documented.
 - 7. List of unresolved issues, seasonal or deferred testing, and other concerns that could affect facility operation.
 - 8. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. (about four to six pages).
 - 9. Attach appendices containing all commissioning documentation, including logs, minutes, reports, deficiency lists, communications, findings, etc., except that specified to be part of the Commissioning Record.
- C. Recommissioning Manual: Revise the Commissioning Plan documents, checklists, and Functional Test forms as necessary based on accepted recommendations of the final Commissioning Report. Provide step-by-step instructions for recommissioning, blank forms, and cross-references to O&M data needed during recommissioning.

2.8 POST-OCCUPANCY PHASE

- A. Coordinate deferred and seasonal Functional Tests; verify correction of deficiencies.
- B. On-Site Review: 10 months after Substantial Completion conduct on-site review with Owner's staff.
- 1. Review the current facility operation and condition of outstanding issues related to the original and seasonal commissioning.
 - 2. Interview staff to identify problems or concerns they have operating the facility as originally intended.
 - 3. Make suggestions for improvements and for recording these changes in the O&M manuals.
 - 4. Identify areas of concern that are still under warranty or are the responsibility of the original construction contractor.
 - 5. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

END OF SECTION

SECTION 01 9115 - FUNCTIONAL PERFORMANCE TESTING PROCEDURES

PART 1 GENERAL

1.1 WORK INCLUDED

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

1.2 SCOPE

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

1.3 Related Work and Documents

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

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

1.4 Definitions and Abbreviations

- A. Refer to Section 01 9113.

1.5 Functional Performance Testing

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

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

successful completion. More significant deficiencies will require failure of the test and re-testing. Deficiencies of this magnitude will result in an Action Item on the Action List. The resolution of the deficiency will then subsequently be tracked by the Commissioning Authority via the Action List. All tests shall be repeated until successful completion. Refer to more specific provisions below.

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

1.6 Coordination Between Testing Parties.

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

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

1.7 FUNCTIONAL PERFORMANCE TEST ACCEPTANCE CRITERIA

- A. The Acceptance Criteria shall be as follows unless more specifically indicated within individual tests. Commissioning Authority may exercise professional judgment to relax requirements and pass tests and recommend approval when appropriate.
1. Capacity and/or equipment performance will generally be as specified $\pm 5\%$.
 2. Efficiency where specifically indicated in the documents will be $\pm 5\%$. When inferred from manufacturer's catalogue data, criteria will be $\pm 10\%$.
 3. Balancing-related criteria will be $\pm 5\%$ for water and $\pm 10\%$ for air.
 4. Accuracy/repeatability on sensing devices will be as specified for the device. Commissioning Authority and TAB will use calibrated gages for independent validation and use judgment in passing or failing the devices. In many cases, the coordination of multiple related sensors is more important than absolute accuracy.
 5. Loop response and set point deviation criteria will be as specified in Section 23 0859.
 6. HVAC sequence-related criteria will be as explicitly specified in the documents and as interpreted by the Commissioning Authority. Code required sequencing shall be per the applicable code.
 7. System sequences shall be as required by the approved shop drawings.
 8. Motor Phase Imbalance: Shall be no more than 2% (Amps and Volts).
 9. Noise Levels:

- a) Occupied spaces: As indicated in the Basis of Design document. Otherwise, noise level shall be as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
- b) At limits of the enterprise or facility: As required by current local ordinances.
- 10. Indoor Environmental Parameters (T, RH, CO₂, VOC): Shall be as indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the ASHRAE Handbooks for the applicable occupancy.
- 11. Air Pressurization: As indicated in the Basis of Design document. Otherwise, as indicated in the most current version of the ASHRAE Handbooks for the applicable occupancy. Smoke/shaft pressurization shall be as required by NFPA to maintain maximum door opening forces and to restrict the passage of smoke.
- 12. Indoor Lighting Levels: As indicated in the Basis of Design document. Otherwise, as recommended in the most current version of the IES Handbooks for the applicable occupancy.
- 13. Electrical Systems: Shall be in accordance with manufacturer's recommendations of individual components and devices, NFPA 70B and International Electrical Testing Association (NETA) testing specifications NETA ATS-Latest Version.
- 14. Inter-system interfaces and coordination: as specified and generally to ensure safe, reliable, and robust operation.

PART 2 PRODUCTS

2.1 INSTRUMENTATION

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

PART 3 FUNCTIONAL PERFORMANCE TESTS (SYSTEMS AND EQUIPMENT RELATED)

3.1 PREREQUISITES

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

3.2 FUNCTIONAL TESTING PROCESS

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

3.3 COMMON ELEMENTS FOR ALL SYSTEMS

- A. Required submittal documentation shall be present and located convenient to testing area. Validate that all required documentation has been submitted and is per the contract requirements.
- B. Contractor shall provide the completed Start-Up Procedures prior to the time of testing. Commissioning Authority shall review the Start-Up Procedure documentation and spot-check prior to the beginning of FPT.
- C. Contractor shall demonstrate that access is sufficient to perform required maintenance.
- D. BAS trends shall have been established as required in the documents. These shall be reviewed prior to or during FPT.

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

3.4 TAB VERIFICATION OF MECHANICAL SYSTEMS

- A. Commissioning Authority shall review TAB reports.
- B. Participants shall include: Commissioning Authority, Owner's Representative, and TAB.
- C. The Commissioning Authority will select up to 10% of the readings from the Balancing Reports and spot-check them. The maximum failure rate for this sample is 10% and the system shall be re-balanced and re-documented if this rate is exceeded. The readings selected by the Commissioning Authority may include supply air diffuser readings (both minimum and maximum readings for VAV boxes), main and branch supply duct traverse readings, outside/return air flow readings, exhaust air flow readings, water flow readings, amp readings, and water pressure drop readings through coils, heat exchangers, and other hydronic elements. For all readings a deviation of more than what is allowed in the TAB specification 23 05 93 between the verification reading and reported data shall be considered as failing the FPT. All readings that fail the FPT shall require re-balancing.

3.5 VARIABLE SPEED DRIVES

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

3.6 AIR HANDLING UNITS AND ROOFTOP UNITS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan and open/close of outdoor air damper.
- E. Start heating and cooling systems; manipulate control device to obtain maximum cooling and heating. Measure temperatures and pressures to determine capacity.
- F. Weather permitting, cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
- G. Check calibration of control devices and for stable control response and component performance including chilled water coils, hot water coils, economizer cycles, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- H. Verify operation of the enthalpy wheels (AHU only)
 - 1. Inspect the installation visually for proper rotation and seal and undamaged media.

2. Check cross contamination and re-entrainment testing results are done under the applicable section.
 3. Check the full sensible and latent recovery efficiency at peak summer conditions.
 4. With different weather conditions, check the mode of control. In winter, check the discharge loop control and make sure sensors are calibrated and that heating does not overshoot and require cooling. In mild conditions, ensure minimum rotation/recovery. In summer conditions, ensure maximum recovery.
 5. Check the frost protection override control loop.
 6. Test operation during power outage in the context of the associated air handler.
- I. Check for free and adequate flow of condensate.
 - J. For variable speed fans, manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions. Manually ramp fan speed from minimum to maximum to ensure stable operation of fans. Record representative part load output from the drive. Check calibration of control input. Check drive bypass operation if applicable.
 - K. Ensure minimum required ventilation rates are maintained across the full range of control (where applicable).
 - L. Test all interfaces with the fire alarm system and all smoke control sequences.
 - M. Verify interlocks with exhaust fans where applicable.
 - N. Test proof alarming where applicable.
 - O. Test operation of applicable safeties including freezestats, high and low static devices, smoke detection, duct humidity, and others. Check AHU component status in each event.
 - P. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
 - Q. Test all Fireman Control and Override sequences.
 - R. Simulate power outage and ensure automatic and orderly restart.

3.7 EXHAUST AND SUPPLY FANS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Check the capacity of the fan at maximum conditions.
- F. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.

- G. Verify interlocks with AHUs and RTUs where applicable.
- H. Test all interfaces with the fire alarm system and all smoke control sequences.
- I. Test proof alarming where applicable.
- J. Simulate failures of fans and ensure proper start-up of backup fans.
- K. Test operation of applicable safeties including high and low static devices, smoke detection, and others.
- L. Simulate power outage and ensure automatic and orderly restart.

3.8 DUCTLESS SPLIT SYSTEMS

- A. Participants shall include: Commissioning Authority, Mechanical Contractor, TAB, and BAS.
- B. Sample: 100%; Maximum failure limit: 10%
- C. Commissioning Authority shall review Start-Up Procedure and TAB report.
- D. Verify automatic start/stop of fan.
- E. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode. Minimum modes shall include:
 - 1. Full Cooling
 - 2. Full Heating
- F. Check proper operation and charge of refrigerant circuit.
- G. Confirm compressor cycling is within allowable frequency
- H. Confirm refrigerant piping is installed for adequate oil return
- I. Check calibration of control devices and for stable control response and component performance including chilled water coils, electric reheat coils, humidifiers, and others. Ensure proper coordination of control loops and that no fighting or energy wastes result.
- J. Check for free and adequate flow of condensate.
- K. Check for adequate air distribution.
- L. Test all interfaces with the fire alarm system and all smoke control sequences.
- M. Test proof alarming. Where applicable, verify interface between unit packaged controls and BAS.
- N. Check system status and operation in the Off, Unoccupied, and Occupied modes of operation. Validate proper start up and shut down sequences.
- O. Simulate power outage and ensure automatic and orderly restart.

- P. In winter, verify operation of low ambient heat rejection control of DX circuit

3.9 VARIABLE REFRIGERANT TERMINAL UNITS

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

3.10 BUILDING AUTOMATION SYSTEM

- A. Participants shall include: Commissioning Authority and BAS.
- B. Refer also to Section 23 0859 for BAS Commissioning requirements.
- C. Commissioning Authority shall review Start-Up Procedure.
- D. Controls system sampling will typically correspond to the sampling rate of a system or piece of equipment. These sampling rates are indicated above for the respective item.
- E. Operate the equipment and subsystems through all specified modes of control and sequences of operation including full and part load conditions, and emergency conditions.
- F. Verify that equipment operates in accordance with design intent and approved control diagrams. This shall include checking the operation of dampers, valves, smoke detectors, high and low limit controls, of a sample of 25% of components with a maximum failure limit of 10%.
- G. Analog Input (AI) Sensors: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Spot-check AI sensors (space temperature sensors, outside, return, and mixed air temperature sensors, discharge air temperature sensors, chilled water and hot water temperature sensors, and humidity sensors, air and water differential pressure sensors, airflow monitoring stations, etc.) for specified accuracy.

- H. Analog Outputs - Valves, Dampers and Actuators: Sample rate of 50% of the inputs on the sampled devices will be used with a maximum failure rate of 10%. Ensure that the valves and dampers modulate freely and their actuator's close-off or seal against the maximum pressure differential. Ensure that the actuators stroke throughout the correct range (correlated with the programmed range) under operations pressures anticipated and that the positioners are set correctly where applicable.
- I. Establish trends of control system points for a minimum of a two-week period prior to and throughout the Acceptance period. Trends shall be analyzed to identify any control problems, lack of capacity, control loops fighting or unstable or other operational anomalies.
- J. Automatic Switches: Spot-check (at a sample of 50% of the inputs on the sampled devices with a maximum failure rate of 10%) the operation of all automatic switches (pressure switches, current switches, flow switches, and others) to ensure that they are adjusted to proper make and break settings.
- K. Verify the standalone functionality of the controllers. Disconnect LAN communication wiring and ensure that the controller functions properly and that the loss of communication is acknowledged by the interface. Restore communications and ensure an orderly restoration to normal control.
- L. Verify that the BAS interface, BAS software, graphics and functions are in accordance with design intent and approved control diagrams.
- M. Check dial-in communications and internet access where applicable to ensure functionality.

3.11 LIGHTING AND LIGHTING CONTROL SYSTEM

- A. Participants shall include: CA, EC.
- B. Sample: 100%, Failure Limit 10%
- C. Review Factory-Certified Start-Up Tests. Commissioning agent may opt to attend demonstration of lighting controls.
- D. Verify occupancy sensor placement and test reliability of activation/deactivation.
- E. Test photocells for functionality and accuracy.
- F. Spot-check switches to ensure proper operation and circuiting.
- G. Spot-check lighting levels to ensure compliance with IES and/or the design requirements for the respective occupancy.
- H. Test operation of daylight dimming control system if applicable. Ensure lights are banked parallel to the daylight source.

END OF SECTION

SECTION 01 9119 – BUILDING ENVELOPE COMMISSIONING

PART 1 GENERAL

1.1 SECTION INCLUDES

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

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

1.4 REFERENCE STANDARDS

[If LEED v4]:

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

[If LEED v4.1]:

- A. ASHRAE Guideline 0–2013 – The Commissioning Process
- B. ASTM E2947-16: Standard Guide for Building Enclosure Commissioning

1.5 SUBMITTALS

- A. Owner's Project Requirements (OPR): A written document, prepared by the owner, outlining the owner's expectations and goals for the performance of the building upon project completion.
- B. Basis of Design (BOD): A written document, prepared by the Architect and design team, outlining the primary thought processes and assumptions behind the design decisions that were

made to meet the Owner's Project Requirements. The Basis of Design describes the systems, components, conditions, and methods chosen to meet these requirements.

- C. Commissioning Plan: An overall plan, prepared by the Cx Provider and BECx Provider, which provides the structure, schedule and coordination planning for the commissioning process.
- D. Field Observations: The BECx Provider shall record observations, and measurements on performed tests. Photographs, forms, and other means appropriate for the application shall be included. BECx Provider shall compile site reports and include them in systems manual and commissioning report.
- E. Issues Log: BECx Provider shall prepare and maintain an issues log that describes design, installation, and performance issues that are in variance with the OPR, BOD, and Contract Documents. BECx Provider shall document corrective action taken for systems and equipment that fail tests including the required modifications to systems and equipment and revisions to test procedures, as applicable.
- F. Final Commissioning Report: BECx Provider shall document results of the commissioning process including unresolved issues and performance of systems and assemblies. The commissioning report shall indicate whether systems are performing in accordance with the OPR, BOD, and Contract Documents. The commissioning report will be updated and re-submitted after the 10-month warranty site observation.
- G. The Trade Contractors shall provide copies of documents gathered or developed during the construction process to the Building Envelope Commissioning Provider in a timely and accurate manner. The documents required are:
- H. Construction schedule, including estimated dates for system installations and testing. Provide updated schedules as appropriate.
- I. Procedures and status reports, including deficiencies noted.
- J. Minutes from all meetings concerning building envelope contractors and/or the building envelope commissioning process.
- K. Field checklists used by the field technicians.
- L. As-built records, including approved submittals, warranties, and operations manuals.

1.6 QUALITY ASSURANCE

- A. Appropriate personnel (i.e. Project Manager and/or Field Foreman) employed by the General Contractor and certain Trades Contractors shall assist the BECx Provider in coordinating and executing the required commissioning activities. These personnel shall become familiar with the Commissioning Plan and shall coordinate the tasks, documentation and submissions required by this Plan. These personnel shall review these documents for compliance with the commissioning requirements and shall arrange for remedies to deficiencies noted in these documents.
- B. The owner has engaged an independent Building Envelope Commissioning Provider (BECx Provider). The Contractor shall properly coordinate with the BECx Provider throughout the construction of the project.
- C. The BECx Provider will be an objective advocate of the owner observing the commissioning activities of the Contractor and will make final recommendations to the owner regarding functional

performance of the commissioned building systems. The BECx Provider will prepare a Commissioning Plan for coordination with the design/build team to assure an efficient design and construction process.

- D. All approved submittal data for building envelope systems and components to be commissioned shall be submitted to the BECx Provider for use in the BECx process. The Contractor shall submit additional copies of submittals, as requested, for the use in the Building Envelope Commissioning process.
- E. The Contractor shall schedule the work considering the activities to be performed by the Building Envelope Commissioning Provider. No claim for delay or request for an extension of Contract Time will be allowed as the result of the scheduled activities of the Building Envelope Commissioning Provider.

1.7 FIELD CONDITIONS – NOT USED

PART 2 PRODUCTS

2.1 TOOLS AND EQUIPMENT

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

PART 3 EXECUTION

3.1 CONSTRUCTION CHECKLISTS

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

3.2 BUILDING ENVELOPE COMMISSIONING (BECX) MEETINGS

- A. BECx meetings will be held periodically as determined by BECx Provider.

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

3.3 REPORTING

- A. BECx Provider will provide status reports to GC, A/E and Owner as needed and/or after each site visit.
- B. BECx Provider shall submit non-compliance and deficiency reports to GC, A/E and Owner as needed and/or update after each site visit.
- C. BECx Provider shall provide a final summary report to the Owner at the completion of the project.
- D. BECx Provider shall provide a 10-Month Warranty review site observation and report after the completion of the project.

3.4 MOCK-UP AND FINAL CONSTRUCTION

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

3.5 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope

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

B. Development of Test Procedures

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

C. Coordination and Scheduling

- 1. GC will provide sufficient notice to BECx Provider regarding completion schedule for materials and systems. GC will schedule Functional Performance Tests with CT. BECx Provider shall witness and document functional testing of materials and

assemblies. BETA shall execute tests under direction of BECx Provider. BETA may be the same entity as the BECx Provider if deemed the best value to the project.

2. Successful completion of mock-up functional performance testing shall occur prior to full production installation of building enclosure materials and systems

D. Laboratory Mockup Testing

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

E. Onsite Off-Building Mockup Testing

1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
2. Integrated Exterior Mockup Testing Program: Perform the following tests in the following order:
 - a. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
 - c. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. (E283 6.24psf) Maximum air leakage of 0.06 cfm per sq.ft.
 - d. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration. (E331 12psf)
 - e. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
 - f. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
 - g. Sealant Durability: ASTM C794. Per Manufacturer's recommendations and stated values.
 - i. Use C1521 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints¹ instead for sealants
 - h. Outdoor-Indoor, Sound-Transmission Loss: ASTM E966. <Insert value>.
 - i. Outdoor A-Weighted Sound Levels: ASTM E1014. <Insert value>.
 - j. Outdoor Sound Measurements Using Digital Statistical Sound Analysis: ASTM E1503. <Insert value>.

F. First Installation Mockup Testing

1. Wall Mockups: Perform the following tests in the following order:

- a. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
- b. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
- c. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.06 cfm per sq.ft.
- d. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
- e. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
- f. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
- g. Pull Test for EIFS: ASTM E2359. Per Manufacturer's recommendations and stated values.
- h. Sealant Durability: ASTM C794. Per Manufacturer's recommendations and stated values.

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

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

12. Water-Spray Test for terminations and transitions: AAMA 501.2. No evidence of water penetration.

H. Building Enclosure Testing

1. Building Enclosure Testing: Perform testing before installation of interior finishes unless otherwise indicated.
2. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
3. Building Wall and Fenestration Testing: Perform the following tests in the following order on two exterior wall specimen approximately 12 feet tall and 20 feet wide to be designated by the Owner at each stage of completion, including 30%, 60%, and 90% of the Exterior Walls prior to the installation of exterior insulation or cladding (unless it is integral to the air and water control layer such as Insulated Metal Wall Panels):
4. Smoke Testing: ASTM E1186 at a static-air-pressure differential of 1.57 lbf/sq. ft.
5. Opaque Wall Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.04 cfm/sq.ft.
6. Window Air Infiltration: ASTM E783 at a static-air-pressure differential of 1.57 lbf/sq. ft. Maximum air leakage of 0.06 cfm per sq.ft.
7. Water Penetration under Static Pressure: ASTM E1105 with minimum uniform static-air-pressure differential of 8.0 lbf/sq.ft. No evidence of water penetration.
8. Water Penetration under Dynamic Pressure: AAMA 501.1 at a test pressure of 8.0 lbf/sq.ft. No evidence of water penetration.
9. Pull-off Strength of Adhered Air Barriers: ASTM D4541 as modified by ABAA. Minimum 16 lbf/sq. in. adhesion to substrate.
10. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
11. Completed Roof Testing:
 - a. Flood Testing of Horizontal Waterproofing: ASTM D5957 or Electronic Leak Detection ASTM E7877. No evidence of water penetration for a minimum 48 hours with flood test.
 - b. Location of Wet Insulation in Roofing Systems: ASTM C1153. No wet insulation.
 - c. Complete Whole Building Air Barrier Testing
 - d. Whole Building Air Leakage Rate by Fan Pressurization: ASTM E3158. Maximum Air Leakage Rate: 0.40.
12. Acoustic Performance Testing:
 - a. Outdoor-Indoor, Sound-Transmission Loss: ASTM E966. <Insert value>.
 - b. Outdoor A-Weighted Sound Levels: ASTM E1014. <Insert value>.

- c. Outdoor Sound Measurements Using Digital Statistical Sound Analysis: ASTM E1503. <Insert Value[ZEM1]>.

[KPN2]3.6 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

A. Documentation

1. BECx Provider will witness and document results of FPT.
2. Non-Conformance
3. BECx Provider will record results of functional testing. Deficiency or non-conformance issues will be noted and reported to GC, A/E and Owner.
4. Corrections of minor deficiencies identified may be made during tests at discretion of BECx Provider. In such cases, deficiency and resolution will be documented.
5. Every effort will be made to expedite testing and minimize unnecessary delays, while not compromising integrity of tests. BECx Provider shall not overlook deficient work or loosen acceptance criteria to satisfy scheduling or cost issues unless directed to do so by the Owner.
6. Deficiencies are handled in the following manner:
 1. When there is no dispute on deficiency and Sub-contractor accepts responsibility for remedial action:
 - a. BECx Provider documents deficiency and Sub-contractors response and intentions and they go on to another test or installation. BECx Provider submits deficiency report to GC, A/E and Owner. Copy is provided to Sub-contractor by GC. Sub-contractor corrects deficiency and certifies that material or assembly is ready to be retested. GC informs CT of retesting schedule.
 - b. GC reschedules test with BECx Provider and BETA.
 2. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - a. BECx Provider documents deficiency and Contractor's response. BECx Provider submits deficiency report to GC, A/E and Owner. Copy is provided to Sub-contractor by GC.
 - b. GC facilitates resolution of deficiency. Other parties are brought into discussions as needed. Final interpretive authority is with A/E. Final acceptance authority is with the Owner.
 - c. GC documents resolution process.
 3. Once interpretation and resolution has been decided, appropriate party corrects deficiency, GC reschedules test, and test is repeated until satisfactory performance is achieved.

B. Cost of Retesting

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

3.7 COMMISSIONING DOCUMENTATION

A. Final Report Details

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

END OF SECTION

SECTION 02 3200 - GEOTECHNICAL INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Two Geotechnical Reports prepared by ECS Mid-Atlantic, LLC are included in the project manual.
 - 1. Preliminary Geotechnical Engineering Report, dated March 5, 2019.
 - 2. Final Geotechnical Engineering Report, dated TBD (not yet complete).

1.3 SITE CONDITIONS

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

1.4 WARRANTY

- A. Neither Frederick County Public Schools, nor the Engineer, represent, warrant or guarantee that the materials actually encountered in the prosecution of the work, or any part thereof, will be of the same character as those indicated by the sample or logs of the test borings, and if the Contractor relies, for any purpose, upon the accuracy or completeness of said borings or log information, he does so at his own risk.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION



ECS Mid-Atlantic, LLC

Preliminary Geotechnical Engineering Report

East County Area Elementary School – Phase I

Gas House Pike
Frederick, Maryland

ECS Project Number 13:8993

March 5, 2019





ECS MID-ATLANTIC, LLC

Geotechnical • Construction Materials • Environmental • Facilities

"Setting the Standard for Service"

March 5, 2019

Mr. Scott Moir
GWWO Architects
800 Wyman Park Drive
Suite 300
Baltimore, Maryland 21211

ECS Project No. 13:8993

Reference: Preliminary Geotechnical Engineering Report
East County Area Elementary School – Phase 1
Gas House Pike
Frederick, Frederick County, Maryland

Dear Mr. Moir:

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. 13:10090-GP, dated December 6, 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 GWWO Architects 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

Appendix B – Field Operations

- Reference Notes for Boring Logs
- Boring Logs (B-1 through B-10)

Appendix C – Laboratory Testing

- 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 ten (10) soil test borings drilled to depths of approximately 18.5 to 38.8 feet below existing grades.
- Beneath the surface cover, natural soils were encountered below the surface cover extending to depths of up to 20 feet. The natural soils were classified as SILT (ML, ML/CL), SAND (SP-SM, SM), and CLAY (CL/ML).
- Weathered rock material was encountered in nine (9) borings (B-2 through B-10) at depths of 8.5 to 18.5 feet below existing grades (EL 522.5 to EL 494.5). Depending on final grades, excavation issues related to weathered rock may be encountered.
- Groundwater seepage into our borings was not observed during our exploration to the depths explored. Groundwater is not anticipated to be a significant factor for the planned at grade construction.
- The planned school building can be supported by conventional shallow foundations consisting of individual column footings and continuous wall footings bearing on natural soils, weathered rock, or new structural fills. Details of the assumed foundation subgrade elevations and loads are contained in the body of the report. Foundations can be designed for a net allowable bearing pressure of 3,000 to 4,000 psf.
- The soils described above are generally expected to be suitable for reuse as engineered fill. Moisture conditioning of subgrades and fill lifts will likely be required.

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 construction of a new prototype elementary school.

The recommendations developed for this report are based on the limited project information supplied by GWWO Architects, the provided “FCPS East County Area Elementary School: Proposal PUD Site Plan” prepared by your office which includes the site location and existing topography, and an email outlining the desired scope of exploration (dated November 27, 2018). This report contains the results of our subsurface explorations, site characterization, preliminary engineering analyses, and recommendations for the design and construction of planned elementary school and associated site improvements.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of the new school building, ten (10) soil test borings were performed at locations selected by GWWO Architects. Seven (7) borings were located within the footprint of the proposed building, two (2) borings within planned parking areas, and one (1) boring within an athletic field. 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. 13:10090-GP, dated December 6, 2018, and authorized by GWWO Architects on January 14, 2019, which includes the Terms and Conditions of Service.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located on the south side of Gas House Pike, in Frederick, Maryland. Specifically, the site is bounded to the north by Gas House Pike, to the west and south by wooded land, and on the east by grassed land.

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 available online historic aerial imagery, the site appears to have remained relatively unchanged since the earliest available topographic maps (1909). The maps and aerials show the land as being wooded or in use as agricultural land since at least the 1940's. Land usage for this site is not indicated on topographic maps prior to 1942.

2.3 CURRENT SITE CONDITIONS

The eastern 1/3rd of the site is in use as agricultural land and the western 2/3rds of the site is wooded. The site can be considered gently to moderately sloping with existing site grades

ranging from approximately EL 540 near the southeast corner of the site to approximately EL 460 along Gas House Pike in the northwest corner of the site.

During our site reconnaissance, a pile of concrete and asphalt material was observed in the vicinity of boring B-4. Rock outcrops were also observed within the wooded portions of the site, in particular, in the areas surrounding boring B-4.

2.4 PROPOSED CONSTRUCTION

The project will consist of the construction of a new prototype school building on the developer-provided site within the planned Hamptons West residential development. We have assumed that the new school will likely be two stories. Planned site improvements will likely include new paved roadways and parking, sporting facilities, and stormwater management facilities.

Existing site grades within the proposed school building footprint range from approximately EL 540 to EL 503. We have assumed the building will likely be slab on grade, in which case, significant cuts and/or fills will be required to reach final grades. No further details regarding the planned site development activities were available at this time.

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 Footprint	Approximately 73,700 square foot in plan view.
# of Stories	Two-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 (Assumed by ECS)
Wall Loads	5 kips per linear foot (klf) maximum (Assumed by ECS)
Lowest Finish Floor Elevation	Not provided

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 seven (7) soil test borings within the proposed building footprint, two (2) borings within parking lots, and one (1) boring within an athletic field. An all-terrain vehicle (ATV)-mounted drill rig was utilized to drill the soil test borings. Borings were generally advanced to depths of 18.5 to 38.8 feet below the current ground surface. Subsurface explorations were completed under the general supervision of an ECS geotechnical engineer or geologist.

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 by GWWO Architects.

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 subsurface soils at several boring locations were obtained for subsequent laboratory testing.

3.2 REGIONAL/SITE GEOLOGY

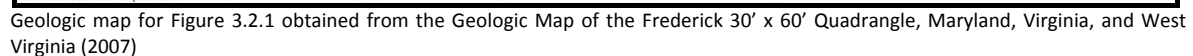
According to the Physiographic Map of Maryland (2008)¹, the site appears to be located near the boundary of the Mt. Airy Upland District and the Unionville Upland District of the Piedmont Plateau Province. The Piedmont Plateau Physiographic Province is an area underlain by ancient igneous and metamorphic 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 rock, is not sharply defined. This transitional zone can contain boulders of more resistant rock as well as highly weathered materials. Materials labeled as “Weathered 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.

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

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 Quartzite interbedded with phyllite of the Sams Creek Formation. The Quartzite interbedded with phyllite is described as light-gray quartzite interbedded with purple phyllite and slate with variegated, conglomeratic phyllite and with bluish-gray, tuffaceous phyllite.

Figure 3.2.1



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

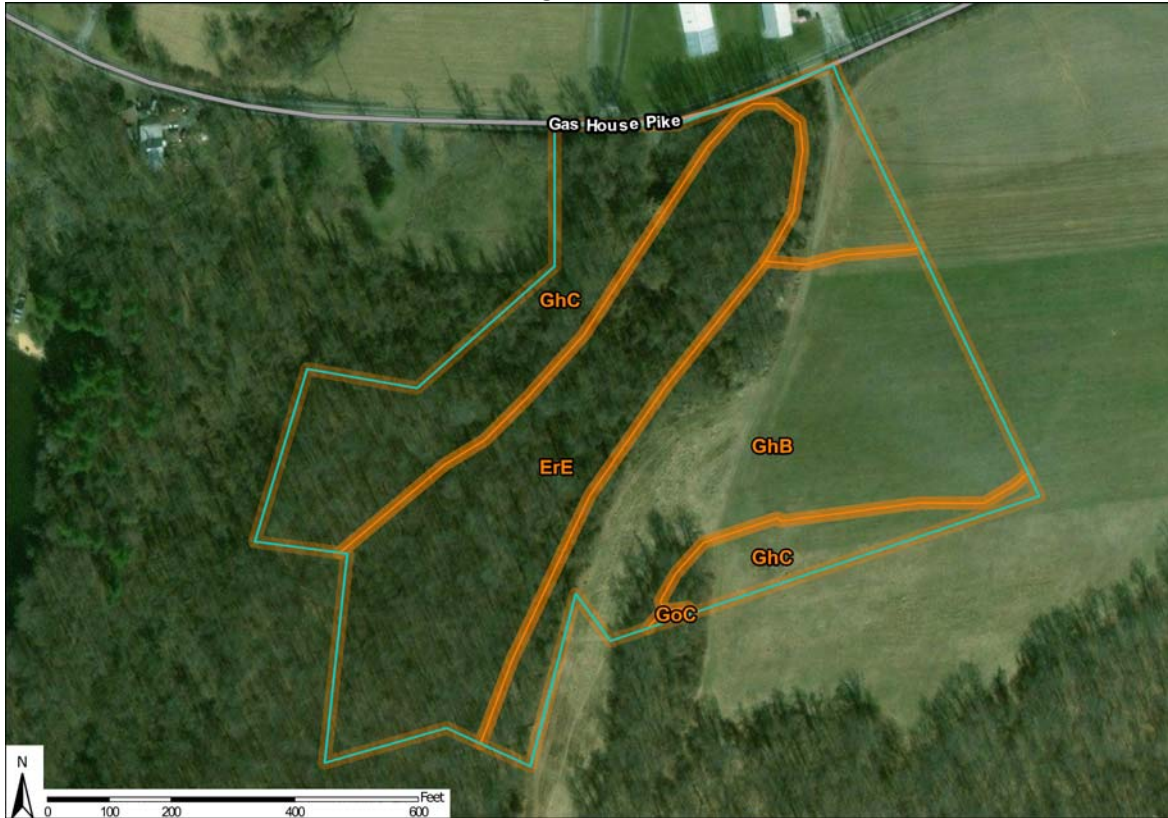
Based on our review of the Soil Survey [USDA - Natural Resources Conservation Service (websoilsurvey.nrcs.usda.gov)], the site soils are mapped as Edgemont-Rock outcrop complex (ErE), Glenelg-Blocktown gravelly loams 3-8% slopes (GhB) and 8-15% slopes (GhC), and Glenville silt loam (GoC). These soil 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
Edgemont-Rock outcrop complex (ErE)	Edgemont	0 to 2" gravelly loam 2 to 38" gravelly clay loam 38 to 72" sandy loam	Well drained	Medium	More than 80 inches	More than 80 inches
	Rock outcrop	0 to 60" unweathered bedrock	Not specified	Medium	Not specified	0 inches to lithic bedrock
Glenelg-Blocktown gravelly loams (3 to 8% slopes) (GhB)	Glenelg	0 to 6" gravelly loam 6 to 24" silty clay loam 24 to 65" channery loam	Well drained	Medium	More than 80 inches	More than 80 inches
	Blocktown	0 to 6" gravelly loam 6 to 17" extremely channery silt loam 17 to 21" weathered bedrock 21 to 25" unweathered bedrock	Well drained	Very high	More than 80 inches	10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Glenelg-Blocktown gravelly loams (8 to 15% slopes) (GhC)	Glenelg	0 to 6" gravelly loam 6 to 24" silty clay loam 24 to 65" channery loam	Well drained	Medium	More than 80 inches	More than 80 inches
	Blocktown	0 to 6" gravelly loam 6 to 17" extremely channery silt loam 17 to 21" weathered bedrock 21 to 25" unweathered bedrock	Well drained	Very high	More than 80 inches	10 to 20 inches to paralithic bedrock; 20 to 40 inches to lithic bedrock
Glenville silt loam (GoC)		0 to 30" silt loam 30 to 70" loam	Moderately well drained	Medium	About 20 to 40 inches	24 to 39 inches to fragipan

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)
0-0.8 ft (Surface cover)	EL 540.0-509.2	n/a	6 to 9 inches of topsoil was encountered at the borings locations	N/A
0.5-20.0 ft	EL 539.3-490.0	I	Very loose to very dense SILT (ML), and SAND (SP-SM, SM, SP), and soft to firm SILT (ML/CL) and CLAY (CL/ML), Moist	3-59
8.5-38.5 ft	EL 522.5-494.5	II	Weathered rock materials that exhibit rock like qualities. Portions of the weathered rock will require rock excavation methods for removal (B-2 through B-10).	>60

Notes: (1) Standard Penetration Test

3.5 GROUNDWATER OBSERVATIONS

Groundwater seepage into our borings was not observed during our exploration to the depths explored. We did observe borehole caving at depths of 12.4 to 37.6 feet which may be an indicator of groundwater presence.

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 seasonal high groundwater level is deeper than the borings performed during this study. Groundwater is not expected to be a significant factor for the planned at-grade development.

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 Shallow Foundations (Spread Footings)

Based on the results of the subsurface exploration, recommendations outlined in the **“Earthwork Operations”** section, and our engineering analysis, the proposed school building can be supported on spread footing foundations when founded on suitable Stratum I natural soils, Stratum II weathered rock, or new compacted fill. The geotechnical analysis of the on-site soils indicates that footings supported on the natural loose to medium dense silty or sandy materials may be designed for a bearing pressure of 3,000 to 4,000 psf. Higher bearing pressures may be possible depending on actual lowest bearing elevations.

The bases of all foundation excavations should be observed and tested by the Geotechnical Engineer. It is anticipated that footing subgrades will generally be supported on natural ground. If existing fill or other unsuitable soils are encountered at planned subgrade levels for any footing, the unsuitable soils shall be undercut to suitable bearing materials. The footing can be directly supported on competent soils at greater depths or, alternatively, the design footing bearing level can be restored through placement of lean (2,500 psi) concrete or engineered fill materials.

Settlement of individual footings, designed in accordance with the recommendations outlined above, is expected to be within tolerable limits. Within the proposed construction, total settlements on the order of one inch are anticipated, with differential settlement on the order of about half the total settlement.

5.1.2 Floor Slabs

According to the subsurface exploration, the soils anticipated below the floor slabs should consist of natural soils 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 sheer 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) 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.

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.

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 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, construction 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 construction debris, topsoil, utilities, and unsuitable surficial materials have been completely removed prior to the placement of Structural Fill or construction of structures.

6.1.2 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 determined 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 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: Any undocumented 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, ML/CL), SAND (SP-SM, SM), and CLAY (CL/ML) soils will be suitable for reuse provided they are conditioned as discussed here. 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.

As indicated on the Laboratory Test Results Summary of Appendix II-B, more than half of the natural moisture contents of the samples tested were observed to be above 20% with two samples exceeding 40%. Optimum moisture content of the Proctor sample tested was 20.5%. Therefore, moisture conditioning of subgrades and fill lifts will likely be required, especially in the wetter months. Soil modification with Quick Lime or Calciment® should prove effective in reducing moisture contents of subgrades and fills.

6.2.3 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.

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 GWWO Architects. 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 a final geotechnical analysis, including additional soil borings, be completed once final site grades and building elevations and 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

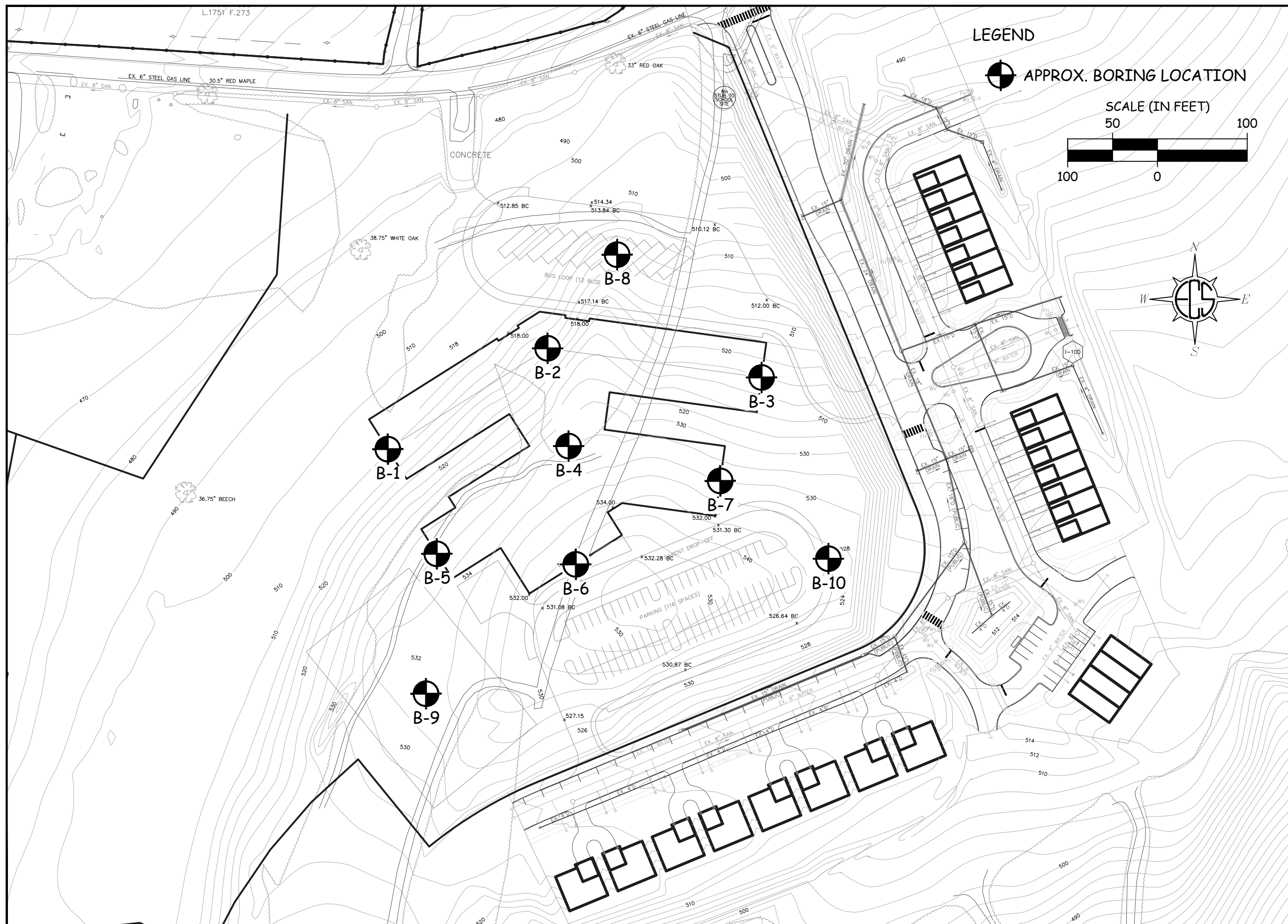


Site Location Diagram **EAST COUNTY AREA ELEMENTARY**

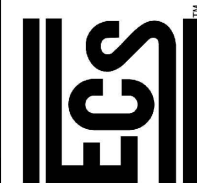
GAS HOUSE PIKE, FREDERICK, MD

GWWO

ENGINEER	JM1
SCALE	1" = 600'
PROJECT NO.	13:8993
SHEET	1 OF 1
DATE	1/16/2019

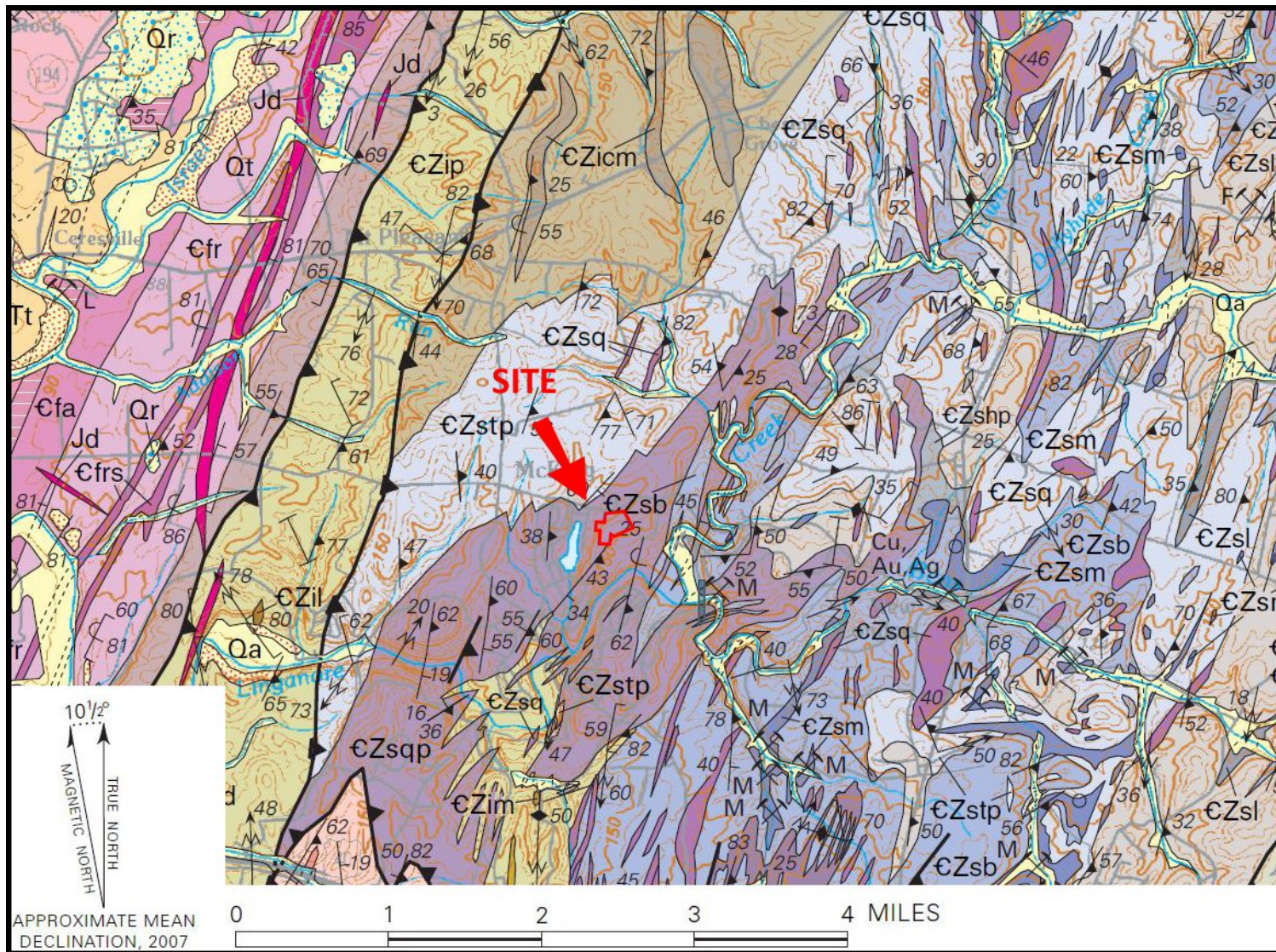


**EAST COUNTY AREA
ELEMENTARY SCHOOL - PHASE I
FREDERICK, MD**



**BORING LOCATION
DIAGRAM
GW00**

ECS REVISIONS	
ENGINEER GAR	DRAFTING AMH
SCALE 1" = 100'	
PROJECT NO. 13-8993	
SHEET 1 OF 1	
DATE 01/24/19	



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)

Appendix A – Drawings and Reports

Geologic Map

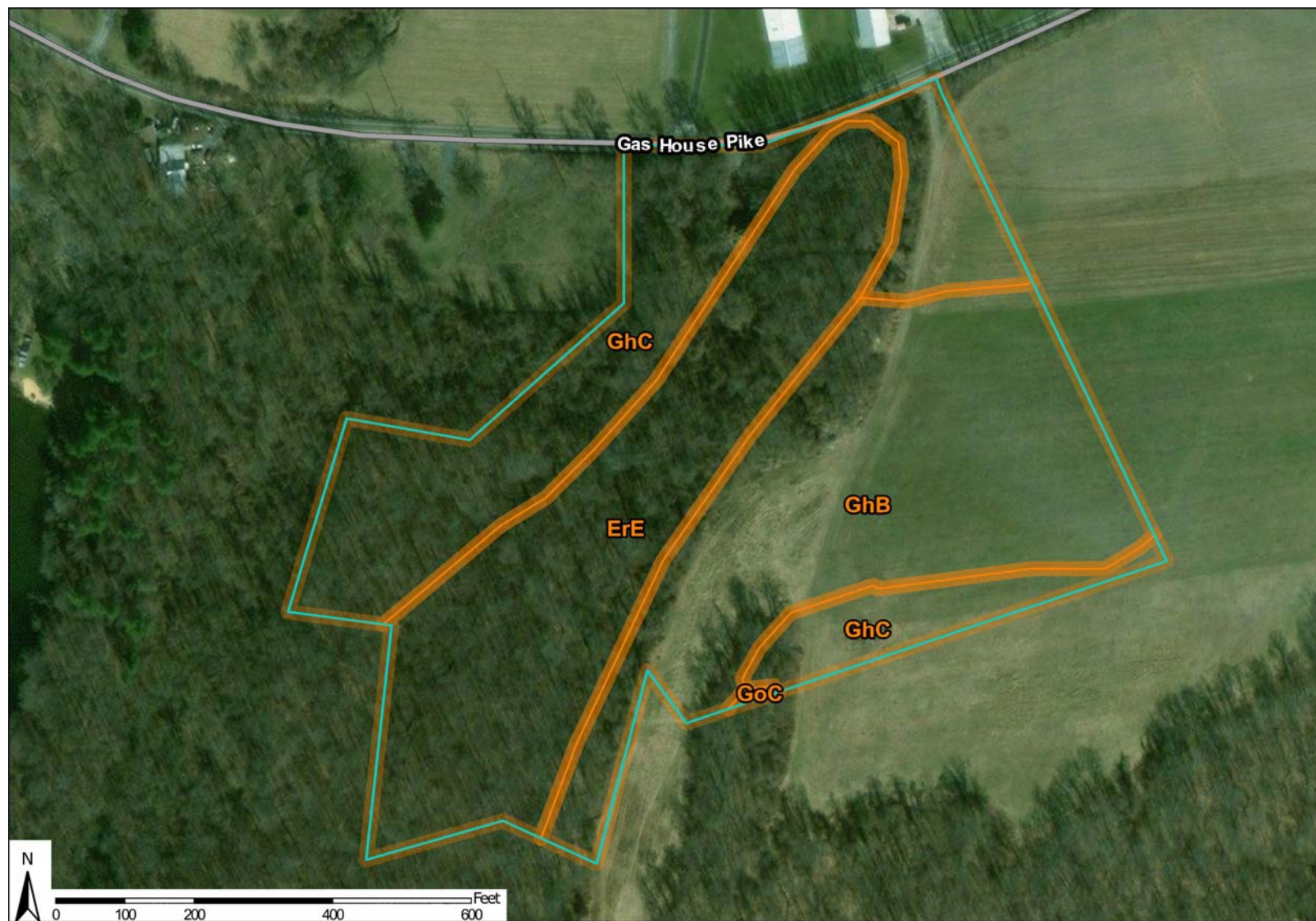
ECS Project No. 13:8993



East County Area Elementary School- Phase I

Gas House Pike

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. 13:8993



East County Area Elementary School- Phase I
Gas House Pike
Frederick, Frederick County, Maryland

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Boring Logs (B-1 through B-10)



REFERENCE NOTES FOR BORING LOGS

MATERIAL ^{1,2}	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL³ 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

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

²To 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.

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

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

⁵Standard 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).

⁶The 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.

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

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

CLIENT GWWO				Job #: 13:8993		BORING # B-1		SHEET 1 OF 1		
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER						
SITE LOCATION Gas House Pike, Frederick, Frederick County, MD										

NORTHING EASTING STATION					SURFACE ELEVATION 510				
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				
					(ML) SILT , trace gravel, trace sand, brown, moist, very loose				
					(ML) SILT WITH SAND, trace gravel, brown to grayish brown, moist, medium dense				
					(ML) GRAVELLY SILT WITH SAND, grayish brown, medium dense				
					(ML) SILT WITH SAND, brownish gray to tannish gray, moist, medium dense				
					END OF BORING @ 20.00'				

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 01/29/19	CAVE IN DEPTH 18.2
WL(SHW)	WL(ACR)	BORING COMPLETED 01/29/19	HAMMER TYPE Auto
WL		RIG CME LC 1 FOREMAN DJ Skaggs	DRILLING METHOD HSA

CLIENT GWWO				Job #: 13:8993		BORING # B-2		SHEET 1 OF 1		
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER						
SITE LOCATION Gas House 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 518			
0	S-1	SS	18	15	Topsoil Thickness [7.00"] (ML) SILT, trace sand, trace clay, contains slight roots, brown, moist, loose		515	5
	S-2	SS	18	15	(ML) SANDY SILT, trace gravel, brown, moist, medium dense		510	11
5	S-3	SS	18	15	(ML) SILT WITH SAND, gray, moist, loose		505	10
10	S-4	SS	18	15	(WR) WEATHERED ROCK SAMPLED AS SILT, gray, moist, very dense [Weathered ROCK]		500	62
15	S-5	SS	5	5			495	50/5
20	S-6	SS	2	2	(WR) WEATHERED ROCK SAMPLED AS SILT, trace gravel, gray, moist, very dense [Weathered ROCK] END OF BORING @ 18.67'		490	50/2
25								
30								

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 01/29/19		CAVE IN DEPTH 18.3				
WL(SHW) WL(ACR)			BORING COMPLETED 01/29/19		HAMMER TYPE Auto				
WL			RIG CME LC 1 FOREMAN DJ Skaggs		DRILLING METHOD HSA				

CLIENT GWWO				Job #: 13:8993		BORING # B-4		SHEET 1 OF 2																																																																																																																																													
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER																																																																																																																																																	
SITE LOCATION Gas House 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																																																																																																																																											
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DEPTH (FT)</th> <th>SAMPLE NO.</th> <th>SAMPLE TYPE</th> <th>SAMPLE DIST. (IN)</th> <th>RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th>WATER LEVELS</th> <th>ELEVATION (FT)</th> <th>BLOWS/6"</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>Topsoil Thickness [6.00"] (ML) SILT WITH SAND, trace gravel, contains slight roots, dark brown, moist, medium dense</td> <td></td> <td></td> <td>530</td> <td>3 8 9</td> </tr> <tr> <td></td> <td>S-2</td> <td>SS</td> <td>18</td> <td>15</td> <td>(SP) SAND WITH GRAVEL, brownish gray, moist, medium dense</td> <td></td> <td></td> <td></td> <td>4 9 14</td> </tr> <tr> <td>5</td> <td>S-3</td> <td>SS</td> <td>18</td> <td>15</td> <td>(SM) SILTY SAND, brownish gray, moist, medium dense</td> <td></td> <td></td> <td>525</td> <td>7 11 11</td> </tr> <tr> <td></td> <td>S-4</td> <td>SS</td> <td>18</td> <td>15</td> <td>(SP-SM) SAND WITH SILT, trace gravel, brownish gray, moist, medium dense</td> <td></td> <td></td> <td>520</td> <td>4 6 7</td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>S-5</td> <td>SS</td> <td>14</td> <td>14</td> <td>(WR) WEATHERED ROCK SAMPLED AS SAND WITH SILT, light tan, moist, very dense [Weathered ROCK]</td> <td></td> <td></td> <td>515</td> <td>7 29 50/2</td> </tr> <tr> <td>15</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>S-6</td> <td>SS</td> <td>4</td> <td>4</td> <td>(WR) WEATHERED ROCK SAMPLED AS SILTY SAND, tannish brown, moist, very dense [Weathered ROCK]</td> <td></td> <td></td> <td>510</td> <td>50/4</td> </tr> <tr> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>S-7</td> <td>SS</td> <td>9</td> <td>9</td> <td>(WR) WEATHERED ROCK SAMPLED AS SILT, trace sand, trace gravel, gray, moist, very dense [Weathered ROCK]</td> <td></td> <td></td> <td>505</td> <td>21 50/3</td> </tr> <tr> <td>25</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>S-8</td> <td>SS</td> <td>3</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td>50/3</td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></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/6"	0					Topsoil Thickness [6.00"] (ML) SILT WITH SAND, trace gravel, contains slight roots, dark brown, moist, medium dense			530	3 8 9		S-2	SS	18	15	(SP) SAND WITH GRAVEL, brownish gray, moist, medium dense				4 9 14	5	S-3	SS	18	15	(SM) SILTY SAND, brownish gray, moist, medium dense			525	7 11 11		S-4	SS	18	15	(SP-SM) SAND WITH SILT, trace gravel, brownish gray, moist, medium dense			520	4 6 7	10											S-5	SS	14	14	(WR) WEATHERED ROCK SAMPLED AS SAND WITH SILT, light tan, moist, very dense [Weathered ROCK]			515	7 29 50/2	15											S-6	SS	4	4	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND, tannish brown, moist, very dense [Weathered ROCK]			510	50/4	20											S-7	SS	9	9	(WR) WEATHERED ROCK SAMPLED AS SILT, trace sand, trace gravel, gray, moist, very dense [Weathered ROCK]			505	21 50/3	25											S-8	SS	3	3					50/3	30								
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"																																																																																																																																												
0					Topsoil Thickness [6.00"] (ML) SILT WITH SAND, trace gravel, contains slight roots, dark brown, moist, medium dense			530	3 8 9																																																																																																																																												
	S-2	SS	18	15	(SP) SAND WITH GRAVEL, brownish gray, moist, medium dense				4 9 14																																																																																																																																												
5	S-3	SS	18	15	(SM) SILTY SAND, brownish gray, moist, medium dense			525	7 11 11																																																																																																																																												
	S-4	SS	18	15	(SP-SM) SAND WITH SILT, trace gravel, brownish gray, moist, medium dense			520	4 6 7																																																																																																																																												
10																																																																																																																																																					
	S-5	SS	14	14	(WR) WEATHERED ROCK SAMPLED AS SAND WITH SILT, light tan, moist, very dense [Weathered ROCK]			515	7 29 50/2																																																																																																																																												
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	S-6	SS	4	4	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND, tannish brown, moist, very dense [Weathered ROCK]			510	50/4																																																																																																																																												
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	S-7	SS	9	9	(WR) WEATHERED ROCK SAMPLED AS SILT, trace sand, trace gravel, gray, moist, very dense [Weathered ROCK]			505	21 50/3																																																																																																																																												
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30																																																																																																																																																					

CONTINUED ON NEXT PAGE.

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 01/29/19		CAVE IN DEPTH 37.6					
WL(SHW) WL(ACR)		BORING COMPLETED 01/29/19		HAMMER TYPE Auto					
WL		RIG CME LC 1 FOREMAN DJ Skaggs		DRILLING METHOD HSA					

CLIENT GWFO				Job #: 13:8993	BORING # B-5	SHEET 1 OF 1	
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION Gas House 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 Thickness [7.00"]			530	
	S-1	SS	18	18	(ML) SILT WITH SAND, trace gravel, brown, moist, very loose				1 2 2
	S-2	SS	18	16	(SM) SILTY SAND, trace gravel, trace clay, brown, moist, medium dense				11 12 10
5	S-3	SS	18	15	(SM) SILTY SAND, trace gravel, brown, moist, medium dense			525	5 8 9
10	S-4	SS	17	10	(WR) WEATHERED ROCK SAMPLED AS GRAVELLY SILT WITH SAND, tan, moist, very dense [Weathered ROCK]			520	12 35 50/5
15	S-5	SS	4	4	(WR) WEATHERED ROCK SAMPLED AS SILT, trace gravel, trace sand, light orange, moist, very dense [Weathered ROCK]			515	50/4
20	S-6	SS	6	6	(WR) WEATHERED ROCK SAMPLED AS SANDY LEAN CLAY, trace silt, trace gravel, orange to gray, moist, very hard [Weathered ROCK]			510	50/6
25					END OF BORING @ 19.00'			505	
30								500	

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	<input type="checkbox"/> WS	<input checked="" type="checkbox"/> WD	BORING STARTED	01/28/19	CAVE IN DEPTH	17.7
WL(SHW)	WL(ACR)		BORING COMPLETED	01/28/19	HAMMER TYPE	Auto
WL			RIG	CME LC 1	FOREMAN	DJ Skaggs
					DRILLING METHOD	HSA

CLIENT GWWO				Job #: 13:8993	BORING # B-7	SHEET 1 OF 1	
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION Gas House 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"
0					Topsoil Thickness [6.00"]			535	
	S-1	SS	18	18	(ML) SILT WITH SAND, trace gravel, brown, moist, loose				
	S-2	SS	18	12	(ML) SILT WITH SAND, grayish brown, moist, loose to medium dense				
5	S-3	SS	18	10					
	S-4	SS	18	12	(ML) SILT WITH SAND, travel gravel brownish gray, moist, dense to very dense				
10									
	S-5	SS	18	10					
15									
	S-6	SS	5	5	(WR) WEATHERED ROCK SAMPLED AS SANDY SILT, trace gravel, grayish brown, moist, very dense [Weathered ROCK]				
20					END OF BORING @ 18.92'				
25									
30									

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	01/28/19	CAVE IN DEPTH 13.8
WL(SHW)	WL(ACR)		BORING COMPLETED	01/28/19	HAMMER TYPE Auto
WL			RIG CME LC 1	FOREMAN DJ Skaggs	DRILLING METHOD HSA

CLIENT GWWO				Job #: 13:8993		BORING # B-8		SHEET 1 OF 1		
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER						
SITE LOCATION Gas House 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% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT </div> </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL					
0					Topsoil Thickness [7.00"] (ML/CL) CLAYEY SILT, trace gravel, trace sand, contains slight roots, brown, moist, soft			1 1 3 20.2		
	Bag 2'-5" S-2	SS	18	15	(ML) SILT WITH SAND, brown, moist, loose		510	2 2 3 5 27.6		
5	S-3	SS	18	15			505	2 2 3 9 6		
10	S-4	SS	18	15			500	4 4 4 8 4		
15	S-5	SS	18	10	(SM) SILTY SAND, trace gravel, dark brown, moist, dense		495	8 18 29 47		
20	S-6	SS	12	6	(WR) WEATHERED ROCK SAMPLED AS SAND, trace gravel, trace silt, dark brown, moist, very dense [Weathered ROCK] END OF BORING @ 19.50'		485	20 50/6 50/6		
25										
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> <div></div> WL <div><div style="border: 1px solid black; width: 10px; height: 10px; display: inline-block;"></div> WS</div> <div><div style="border: 1px solid black; width: 10px; height: 10px; display: inline-block;"></div> WD</div> </div> <div> BORING STARTED 01/29/19 </div> <div> CAVE IN DEPTH 18.2 </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> <div></div> WL(SHW) <div><div style="border: 1px solid black; width: 10px; height: 10px; display: inline-block;"></div> WL(ACR)</div> </div> <div> BORING COMPLETED 01/29/19 </div> <div> HAMMER TYPE Auto </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> <div></div> WL </div> <div> RIG CME LC 1 FOREMAN DJ Skaggs </div> <div> DRILLING METHOD HSA </div> </div>

CLIENT GWWO				Job #: 13:8993	BORING # B-9	SHEET 1 OF 1	
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION Gas House 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 ELEVATION (FT)	BLOWS/6"
					BOTTOM OF CASING LOSS OF CIRCULATION			
0					SURFACE ELEVATION 531			
0	S-1	SS	18	18	Topsoil Thickness [8.00"] (ML) SILT, trace sand, trace gravel, brown, moist, very loose		530	2 2 1
2	S-2	SS	18	12	(ML) SANDY SILT, trace gravel, orangish brown, moist, very loose			3 2 2
5	S-3	SS	18	18	(SP-SM) SAND WITH SILT, trace gravel, orangish black, moist, loose		525	3 3 2
10	S-4	SS	5	5	(WR) WEATHERED ROCK SAMPLED AS SAND WITH SILT, trace gravel, pinkish gray, moist, very dense [Weathered ROCK]		520	50/5
15	S-5	SS	3	3	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND, brownish gray, moist, very dense [Weathered ROCK]		515	50/3
20	S-6	SS	4	4	(WR) WEATHERED ROCK SAMPLED AS GRAVEL WITH SILT And SAND, gray, moist, very dense [Weathered ROCK] END OF BORING @ 18.83'		510	50/4
25							505	
30								

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

WL <input type="checkbox"/> WS <input checked="" type="checkbox"/> WD	BORING STARTED 01/28/19	CAVE IN DEPTH 14.7
WL(SHW) WL(ACR)	BORING COMPLETED 01/28/19	HAMMER TYPE Auto
WL	RIG CME LC 1 FOREMAN DJ Skaggs	DRILLING METHOD HSA

CLIENT GWWO				Job #: 13:8993	BORING # B-10	SHEET 1 OF 1	
PROJECT NAME East County Area Elementary School - Phase I				ARCHITECT-ENGINEER			
SITE LOCATION Gas House 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"
0					Topsoil Thickness [7.00"] (ML) SANDY SILT, trace gravel, contains slight roots, brown, moist, loose to medium dense				
	S-1	SS	18	8					
	S-2	SS	18	12					
5	S-3	SS	18	12					
	S-4	SS	18	10	(SP-SM) SAND WITH SILT, tan, moist, dense				
10									
	S-5	SS	5	5	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND, trace gravel, orangish gray to white, moist, very dense [Weathered ROCK]				
15									
	S-6	SS	7	5					
20					END OF BORING @ 19.08'				
25									
30									

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	<input type="checkbox"/> WS	<input checked="" type="checkbox"/> WD	BORING STARTED 01/28/19 CAVE IN DEPTH 12.4
WL(SHW)	WL(ACR)		BORING COMPLETED 01/28/19 HAMMER TYPE Auto
WL			RIG CME LC 1 FOREMAN DJ Skaggs DRILLING METHOD HSA

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

Plasticity Chart

Grain Size Analysis

Moisture-Density Relationship Curves

Page 1 of 1

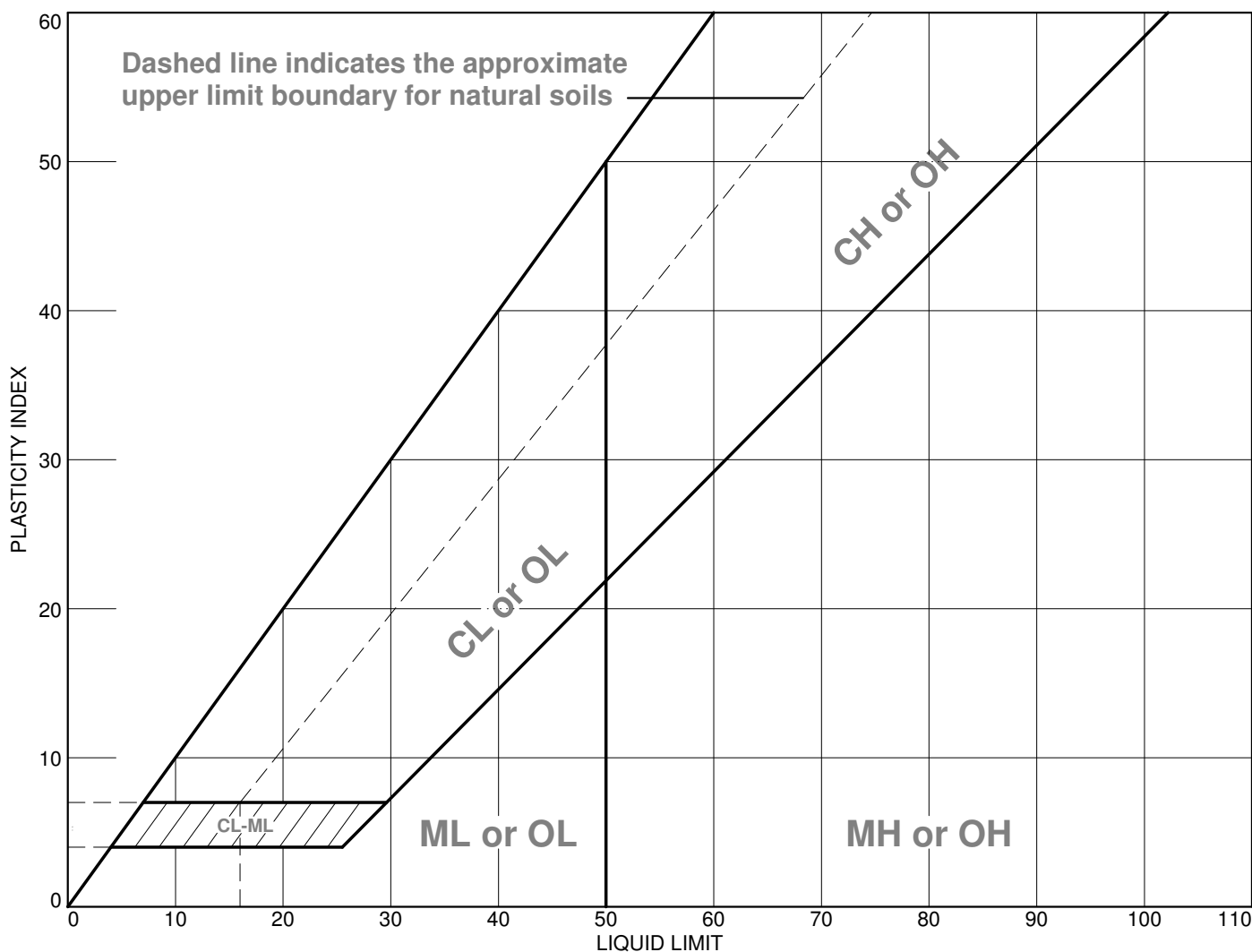
Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

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 **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	NP	NP	NP	74.1	59.4	ML
■	Brown SILT w/Sand	NP	NP	NP	85.3	74.1	ML

Project No. 8993

Client: GWWO

Project: East County Area Elementary School - Phase I

● Source of Sample: B-3

Depth: 8.50-10.00

Sample Number: S-4

■ Source of Sample: B-8

Depth: 2.00-5.00

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

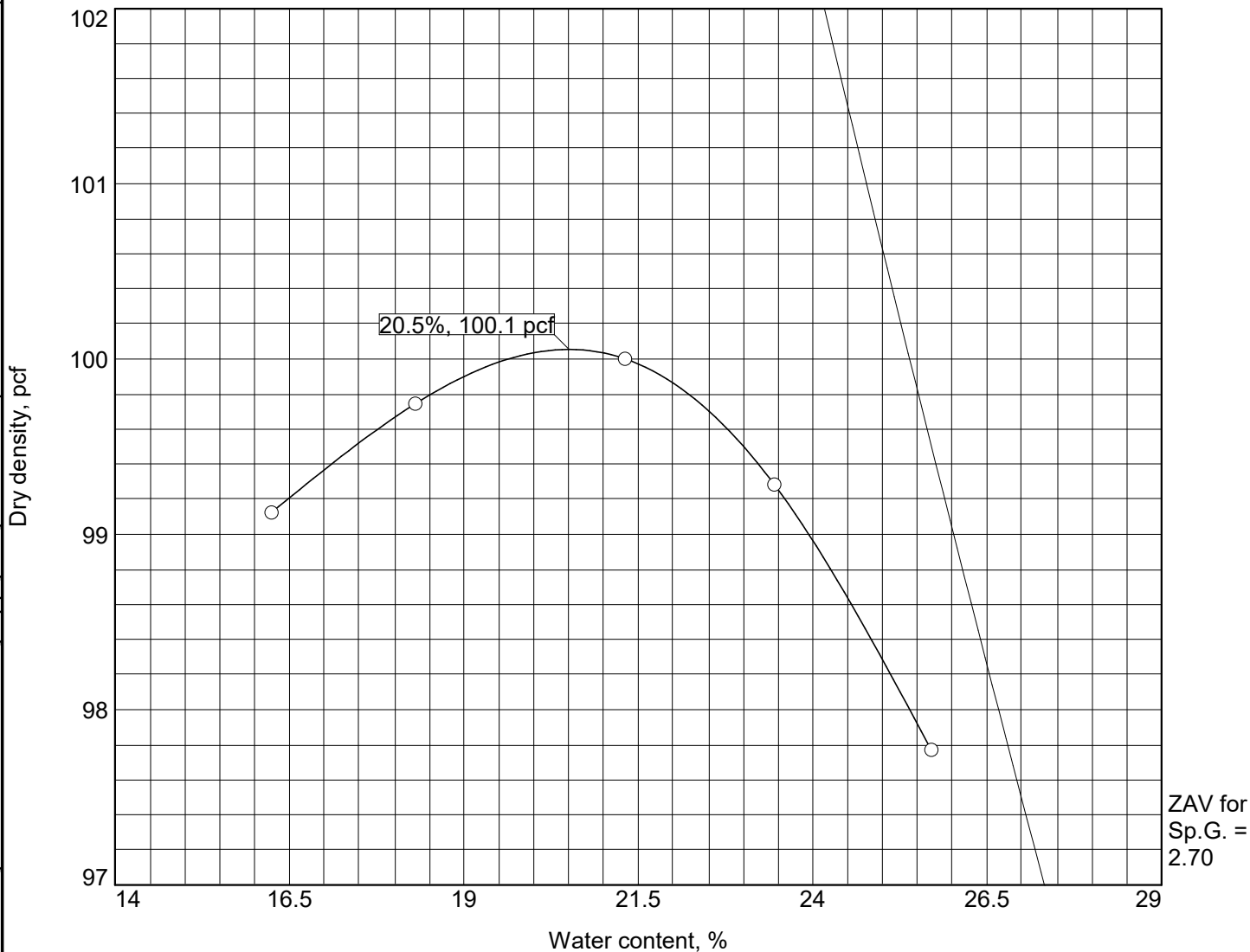
Tested By: PK

Checked By: PK

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

COMPACTION TEST REPORT For Curve No. B-8/Bag



Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
2.00-5.00	ML	A-4(0)		2.7	NP	NP		74.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.1 pcf	Brown SILT w/Sand
Optimum moisture = 20.5 %	
Project No. 8993 Client: GWWO Project: East County Area Elementary School - Phase I Date: 02/12/ Source of Sample: B-8 Sample Number: Bag 2'-5'	Remarks:
 5112 Pegasus Court, Suite S Frederick, MD 21704 Phone: (301) 668-4303 Fax: (301) 668-3519	

Figure

Tested By: PK Checked By: PK

SECTION 02 4113 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Requirements of the General Provisions apply to all work under this section.
- B. Frederick County Division of Utilities and Solid Waste Management – general conditions and specifications for water mains, sanitary sewer and related structures dated January 1, 2015 and as amended.
- C. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Architect for consideration. Those judged to be equal to that specified will receive written approval.

1.2 SUMMARY

- A. This Section requires removal and disposal, off site, of the following:
 - 1. Entrance drive, parking structures, utilities, and adjacent site improvements to limits indicated on drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Work" for use of the building and phasing requirements.
 - 2. Division 2 Section "Selective Structure Demolition" for cutting and patching procedures for selective demolition operations.
 - 3. Division 1 Section "Construction Progress Documentation" for demolition schedule requirements.
 - 4. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
 - 5. Division 1 Section "Construction Waste Management and Disposal" for LEED requirements relating to demolition.
 - 6. Division 32 Section "Planting" for protecting trees remaining on-site.
 - 7. Division 31 Section "Site Clearing" for site clearing and removing above, and below, grade improvements.
 - 8. Division 31 Section "Excavation and Filling" for soil materials, excavating, backfilling, and site grading.
 - 9. Division 23 Sections for cutting, patching, or relocating mechanical items.
 - 10. Division 26 Sections for cutting, patching, or relocating electrical items.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Proposed schedule of operations coordination for shutoff, capping, and continuation of utility services as required.
 - 1. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

- C. Photographs of existing adjacent structures and site improvements.

1.4 JOB CONDITIONS

A. Demolition Phasing

1. The contractor shall prepare and submit a demolition/construction staging plan to the Frederick County Public Schools for approval prior to beginning any construction.

B. Condition of Structures: Owner assumes no responsibility for actual condition of structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.

C. Salvage Materials: Items of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items will not be permitted on site.
2. Owner's salvage list will be provided at Pre-Bid Meeting.

D. Explosives: Use of explosives will not be permitted.

E. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities and injury to persons.

G. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.

H. Utility Services: Maintain existing utilities indicated to stay in service and protect against damages during demolition operations.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

I. Utility Services: Refer to Division 23 and 26 sections for disconnecting, removing, and capping of utility services. Do not start demolition work until utility disconnections have been completed and verified in writing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove weekly from site accumulated debris, rubbish, and other materials resulting from demolition operations.
 1. Burning of combustible materials from demolished structures will not be permitted on site.
- B. Removal: Transport materials removed from demolished structures and legally dispose of off site.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, and concrete protection.

1.5 ACTION SUBMITTALS

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

- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site to provide the water to cement ratio of the design mix, this must be clearly indicated on EVERY delivery ticket to the Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops and vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
- B. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Field quality-control reports.
- E. Minutes of pre-installation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Store reinforcement in a manner that prevents soil, mud, debris, or oil from adhering to the bars. If for any reason soil, mud, debris, or oil is on a bar it will be removed before the bar is installed.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- C. Cement: Store to prevent deterioration or contamination. Cement which has become caked, partially set, or otherwise deteriorated, damaged, or contaminated shall not be used.
- D. Aggregates: Store and handle to preserve gradation and cleanliness. Integration of grades and/or contamination are caused for rejection, and such rejected material shall be removed and not used.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 305R and ACI 305.1, and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301
 2. ACI 117

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

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

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150, Type I.
 - 2. Fly Ash: ASTM C 618, Class F or C. Use only in concrete mixes for foundation footings, CMU wall grout fills and slab-on-grades.
 - 3. Slag Cement: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years'

satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Nominal Maximum Coarse Aggregate Size: 1 1/2 inch (3/4 inch where placement by pumping) nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330, 1 inch (3/4 inch where placement by pumping) nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.
- H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- I. Water: ASTM C 94. The water shall be clean, potable, and free from deleterious substances.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: For embedding in concrete to prevent passage of fluids through joints. Factory fabricated corners, intersections, and directional changes. Use profile of ribbed surface with center bulb. The waterstop is to be embedded 3 inches into concrete unless noted otherwise on drawings.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Membrane shall not be less than 15 mils thick.
 2. Installation shall comply with specification.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Stego Industries, LLC; Stego Wrap 15-mil Class A Vapor Barrier
 - b. Barrier-Bac, Inc.; VB-350 16 mil Class A Vapor Retarder
 - c. W.R. Meadows, Inc.; Sealtight Perminator 15 mil Class A Vapor Retarder

d. Insulation Solutions Inc.; Viper VaporCheck 16 mil Class A Vapor Barrier

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel.

2.8 FLOOR AND SLAB TREATMENTS

A. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, and plasticizing admixture.

2.9 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, according to ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- D. Reglets: Fabricate reglets of not less than 0.022 inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109.

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 18 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum W/C Ratio: 0.45.
 3. Maximum Slump: As indicated.
 4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2 to 4 inch slump.
 5. Air Content: 6 percent, plus 1 or minus 1.5 percent at point of delivery.
- B. Interior Slabs-on-Grade: Normal-weight concrete.
1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Maximum W/C Ratio: 0.45.
 3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
 4. Maximum Slump: 4 inches.
 5. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2 to 4 inch slump.
 6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- C. Suspended Slabs: Lightweight concrete.
1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Calculated Equilibrium Unit Weight: 110 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
 3. Slump Limit: 4 inches plus or minus 1 inch.
 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

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

3.5 VAPOR-RETARDER INSTALLATION

- A. Vapor Barrier: place, protect, and repair membrane according to ASTM E 1643, ASTM F 710 and manufacturer's written instructions. Contractor shall place the vapor barrier directly below the concrete slab and on top of granular fill. Lap joints 6 inches minimum and seal with manufacturer's recommended tape. Sheets to extend to interior face of foundation walls, turn up vertically and terminate flush with top of concrete floor slab. Adhere to foundation wall with manufacturer's recommended tape. Seal all penetrations with manufacturer's recommended methods of boots, mastic or tape.
- B. Granular Fill: Place a minimum of 4 inches compacted granular fill on top of subgrade to elevation tolerances of plus 0 inch or minus ½ inch.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed ACI347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections exceeding 1/8 inch in height.
 - 1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete. Do not apply rubbed finish to smooth-formed finished concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings or mortar setting beds for ceramic or quarry tile, Portland cement terrazzo, and other bonded cementitious floor finishes.
 - C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated, to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
 - D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10 feet long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch. In addition, visually obvious faults in floor flatness shall be corrected at contractor's own expense.
 - E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
 - F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- 3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION
- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 and ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound

manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 30 cu. yd. or fraction thereof.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory (standard) one set of three standard cylinder specimens for each composite sample. Transport the cylinders to laboratory within 24 hours for final curing and testing
 - b. Cast and field cure one set of two standard cylinder specimens for each composite sample. Field cure the cylinders for the first five (5) days, minimum, in the field under the same conditions as the cast concrete. Transport the cylinders to the laboratory for continued curing and testing.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory (standard) cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one field cured specimens at 7 days and one at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. If time of concrete strength gain is affected by materials in the mix, such as fly ash, provide correlation information between the 28-day compressive strength and the final compressive strength prior to performing compressive strength tests.
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Brick masonry units.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Flexible embedded flashing.
 - 8. Miscellaneous masonry accessories.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Contractor will engage and pay for a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength. In lieu of independent testing, manufacturer's certification of plant testing and results is acceptable.
 - 2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 - 4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals: Comply with section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For cement, CMU, and steel reinforcement: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials

- a. For products having recycled content (CMU and steel): Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For products having regionally sourced recycled material (CMU and steel): Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- 3. MR Credit 4: BPDO - Material Ingredients
 - a. For CMU and brick provide Material Ingredient Report.
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. 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. Elevations shall include the locations of mechanical penetrations and show compliance with the reinforcement, opening spacing and lintel requirements indicated on the structural drawings.
- D. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
 - 1. Samples for Initial Selection:
 - a. Decorative CMUs, in the form of small-scale units.
- E. Samples for Verification: For each type and color of the following:
 - 1. Special shapes.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing 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 identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - c. For brick masonry, provide the following:
 - 1) Size variation data verifying that the actual range of sizes falls within specified tolerances.
 - 2) Test reports for efflorescence according to ASTM C67
 - 2. Integral water repellent used in CMUs.
 - 3. Cementitious materials. Include brand, type, and name of manufacturer.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.
 - 7. Joint reinforcement.
 - 8. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings."
1. Require representatives of each entity directly concerned with masonry construction attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency.
 - c. Masonry subcontractor.
 - d. Mechanical subcontractor.
 2. Include in the conference agenda the discussion of the structural details and requirements at wall openings and penetrations as they pertain to wall reinforcement, opening locations and lintels.

1.8 MOCK-UP

- A. Before installing unit masonry, build a sample panel, as indicated in the drawings, of each masonry combination option, using materials selected and indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects, qualities of materials and workmanship and execution. Build one (1) sample panel with each type of brick masonry selected for initial review with full backup. Following review of initial panels, construct two (2) additional sample panels with selections made by Architect for final review and project selection, if required. Four (4) total sample panels will be completed.
1. Locate panel south-facing in a location onsite as directed by FCPS and CM.
 2. Clean exposed faces of panels with masonry cleaner indicated.
 3. Protect approved sample panel from the elements with weather-resistant membrane.
 4. Maintain sample panel during construction in an undisturbed condition as a standard for judging the completed Work.

5. Approval of sample panel 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.
 - a. Approval of sample panel does not constitute approval of deviations from the Contract Documents contained in sample panels, unless Architect specifically approves such deviations in writing.
 6. Demolish and remove sample panel when directed.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Mock-up shall be constructed using Wall Types B.01 and C.02, including all sheathing, weather barrier, and insulation components.
 2. Build a sample panel with each type of exposed unit masonry assembly by full thickness in order to demonstrate inside and outside corners.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Opening shall be 16" x 16".
 - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing)..
 3. Clean exposed faces of mockups with masonry cleaner as indicated.
 4. Protect accepted mockups from the elements with weather-resistant membrane.
 5. Mockups will not be demolished or moved prior to issuance of substantial completion.
 6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

- 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 (600 mm) down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- D. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

- E. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314

2.3 CONCRETE MASONRY UNITS

- A. Sustainable Design Requirements:
 - 1. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Recycled Content: Provide CMU products with recycled content. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. Provide regionally sourced recycled material. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - 4. Provide Material Ingredient Report.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. For ends of sills and caps and for similar applications that would otherwise expose unfinished surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 3. Provide bullnose units for outside corners of interior CMUs unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed exterior units.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ACM Chemistries; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
- D. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 - 2. Density Classification: Normal weight for 8 and 12 inch units.
 - 3. Density Classification: Light weight for interior, non-load bearing 4 and 6 inch units.
 - 4. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.4 BRICK UNITS

- A. Sustainable Design Requirements:
 - 1. Provide Material Ingredient Report.
- B. Manufacturers:
 - 1. Acme Brick: www.brick.com (Option 01)
 - 2. Yankee Hill Brick and Tile: www.yankeehillbrick.com (Option 01)
 - 3. Glen-Gery Brick: www.glengery.com (Option 02)
 - 4. Endicott Clay Products Co: www.endicott.com (Option 02)
- C. Facing Brick: ASTM C216, Type FBS, Grade SW.
 - 1. Option 01
 - a. Color 01: Acme Blend.
 - 1) Marble Gray (50%)
 - 2) Slate Gray (25%)
 - 3) Steele Gray (25%)
 - b. Color 02: Yankee Hill Metro Ironspot Velour
 - c. Mortar Color: TBD
 - 2. Option 02
 - a. Color 01: Glen-Gery Blend
 - 1) TBD (50%)
 - 2) TBD (25%)
 - 3) TBD (25%)
 - b. Color 02: Endicott Medium Ironspot 46 Velour
 - c. Mortar Color: TBD
 - 3. Nominal size: 3-5/8" x 2-1/4" x 8".
 - 4. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.5 MASONRY LINTELS

- A. Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured

2.6 CAST STONE TRIM UNITS

- A. Materials and Properties:
 - 1. Compressive Strength: ASTM C 1194, 6500 psi min at 28 days.
 - 2. Absorption: per ASTM C 1195: 6% maximum at 28 days.
 - 3. Portland Cement: Type I or III, white, ASTM C 150
 - 4. Coarse Aggregates: Granite, quartz or limestone, ASTM C 33, except for gradation.
 - 5. Fine aggregates: Natural sands, except for gradation.
 - 6. Colors: Inorganic iron oxide pigments, ASTM C494
 - 7. Admixtures: ASTM C 494
- B. Size and Shape
 - 1. As indicated on the drawings.
- C. Color and Finish
 - 1. Fine grain texture, free of voids and bugholes.

- 2. Color: As selected by Architect.
- D. Reinforcing: per ASTM A615, epoxy coated when within 1 1/2 inch of the surface.
- E. Anchors: type 304 stainless steel.

2.7 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Colored Portland Cement-Lime Mix:
 - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- G. Aggregate for Grout: ASTM C 404
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- I. Water: Potable

2.8 REINFORCEMENT

- A. Sustainable Design Requirements:
 - 1. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- B. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- C. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- E. Masonry Joint Reinforcement for Multiwythe Masonry:
 - 1. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
- F. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized, carbon-steel continuous wire.

2.9 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
 - 3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Galvanized, self-furring metal lath: flat expanded type, weighing not less than 3.2 lb. per yd² (1.4 kg/m²). Metal lath shall comply with ASTM C847.
 - 1. Basis of Design: 3/8" High Rib Lath (HI-RIB) by Clark-Dietrich

2.10 FLEXIBLE EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing with Elvaloy KEE: Solid-phase flexibilizer added to membrane flashing.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc ; Flex-Flash Flashing: www.h-b.com.
 - b. Hyload ; Product Hyload S/A, Cloaked Flashing System - Self Adhered with Drip Membrane: www.hyload.com.

- c. DuPont; ThruWall Flashing.
- B. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is fully concealed, use flexible flashing.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
- E. Termination Bar: Manufacturer's standard continuous length stainless steel bar complete with stainless steel fasteners.
- F. Cementitious backer board units: size and thickness as specified, complying with ANSI A118.9.

2.12 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 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. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.

2. Use portland cement-lime mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime mortar.
 4. For reinforced masonry, use portland cement-lime mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.
 2. For masonry above grade, use Type S.
- D. Pigmented Mortar: Use colored cement product.
1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Mix to match Architect's sample.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Face brick.
 4. Grout for Unit Masonry: Comply with ASTM C 476.
 - a. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - b. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2. for specified 28-day compressive strength indicated, but no less than 3000 psi.
 - c. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.
- E. Thick Bed Mortar for Adhered Masonry Veneer: Latex Portland Cement Mortar to be weather, frost, shock resistant and meet the following physical requirements:
1. Basis of Design: LATICRETE MVIS Premium Mortar Bed.
 2. Compressive Strength (ANSI A118.7 Modified): > 4000 psi (27.6 MPa).
 3. Total VOC Content: < 0.05 mg/m³.
- F. Thin Bed Mortar for Adhered Masonry Veneer: Latex Portland Cement Mortar to be weather, frost, shock resistant, non-flammable and meet the following physical requirements:
1. Basis of Design: LATICRETE MVIS™ Hi-Bond Veneer Mortar.
 2. Compressive strength (ASTM C270): >=2900 psi (20 MPa).
 3. Shear bond strength (ANSI A118.4 5.2.4): >=300 psi (2.1 MPa).
 4. Sag On Wall (EN 1308): 0.0mm.
 5. Total VOC Content: < 0.05 mg/m³.
- G. Pointing Mortar for Adhered Masonry Veneer: Latex Portland Cement Mortar to be weather, frost and shock resistant, as well as meet the following physical requirements:
1. Basis of Design: LATICRETE MVIS Premium Pointing Mortar.
 2. Compressive Strength (ASTM C91): >=4100 psi (28.3 MPa).
 3. Total VOC Content: < 0.05 mg/m³.
- H. Expansion and Control Joint Sealant for Adhered Masonry Veneer: To be a one component, neutral cure, exterior grade silicone sealant and meet the following requirements:
1. Basis of Design: LATICRETE MVIS Silicone Sealant.

2. Tensile Strength (ASTM C794): 280 psi (1.9 MPa).
3. Hardness (ASTM D751; Shore A): 25 (colored sealant) /15 (clear sealant).
4. Weather Resistance (QUV Weather-meter): 10000 hours (no change).

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 the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. 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.
- E. 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.

3.3 TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following
- B. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- C. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

D. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond pattern unless indicated otherwise on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. 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.
- H. Fill cores in hollow CMUs with grout 16 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. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- 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. Lap reinforcement a minimum of 6 inches.
 - 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 in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses; joints shall occur at intervals not to exceed 40 LF on-center. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
 - 5. Do not locate control joints at or within four feet of opening jambs.
 - 6. Maximum control joint spacing shall not exceed the lesser of 1.5 times the height of 25'-4".
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch (10 mm).
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 FLASHING

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and install continuous termination bar over flashing face; fasten to back-up masonry surface at top with headed fasteners at 16" OC. Install continuous bead of sealant at top of termination bar.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 - 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with

elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.

5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge
- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.10 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 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 60 inches.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor will engage and pay for inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Inspections according to the "International Building Code."
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
 4. Inspect masonry reinforcement.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 1500 sq. ft. (139 sq. m) of wall area or portion thereof.

- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 7. Clean stone trim to comply with stone supplier's written instructions.

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Excavating and Filling."
 3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
 7. Structural steel including chemical and physical properties.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, M-Shapes: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

- E. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.
 - 1. Weight Class: As required by design.
 - 2. Finish: As indicated.
- F. Steel Castings: ASTM A 216, Grade WCB with supplementary requirement S11.
- G. Steel Forgings: ASTM A 668.
- H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: As indicated.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36 carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36 carbon steel.
 - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- E. Threaded Rods: ASTM A 36.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 3. Finish: Plain.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- G. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting".
- B. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
- C. Primer: SSPC-Paint 25 BCS, Type II, zinc oxide, alkyd, linseed oil primer.
- D. Primer: SSPC-Paint 23, latex primer.
- E. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- F. Galvanizing Repair Paint: ASTM A 780.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform,

square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

- H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1 and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
 - F. Do not use thermal cutting during erection.
 - G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
 - H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: As indicated.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1.
 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

- c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 05 1213 - ARCHITECTURALLY-EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

1.2 DEFINITIONS

- A. Architecturally-Exposed Structural Steel: Structural steel complying with designated AESS category as defined in AISC 303.

1.3 REFERENCE STANDARDS

- A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- G. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. SSPC-SP 1 - Solvent Cleaning.
- L. SSPC-SP 6 - Commercial Blast Cleaning.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Schedule and conduct a preinstallation meeting at project site one week prior to start of work of this section; require attendance by all affected installers. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch-up painting, mock-up coordination, Architect's observations, and other requirements for AESS.

1.5 SUBMITTALS

- A. Product data for each type of product specified. Submit paint systems in accordance with Section 09 9600.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For steel: Product-specific declaration or Industry-wide EPD or product-specific EPD.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For regionally sourced steel, if applicable: Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
- C. Shop Drawings: Detailing for fabrication of AESS components.
 - 1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.
 - 2. Include details that clearly identify AESS requirements found in this specification. Provide connections for AESS consistent with concepts shown on drawings.
 - 3. Indicate welds by AWS A2.4 symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined by the designated AESS category.
- D. AESS 1 Samples: Provide samples of specific AESS characteristics. Samples may be small size samples or components of conventional structural steel demonstrating specific AESS characteristics, including surface preparation, sharp edges ground smooth, continuous weld appearance, weld show through, and fabrication mark removal.
- E. Qualification data for fabricator and erector to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, photographs showing detail of installed AESS, and other information specified.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Section 05 1200, engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the work.
- B. Erector Qualifications: In addition to those qualifications listed in Section 05 1200, engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

1.7 MOCK-UP

- A. Locate mock-ups in fabricator's shop. Mock-ups to be full-size unless Architect approves smaller models. Alternatively, when a mock-up is not practical, the first piece of an element or connection can be used to determine acceptability.
- B. Mock-up to demonstrate weld quality, contouring of welds at aligned walls of members, specified surface preparation, and finish coating.
- C. Obtain Architect's written approval of mock-ups before starting fabrication.

- D. Approved mock-ups in an undisturbed condition at Date of Substantial Completion may become part of completed work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle finished pieces in accordance with Section 10 of AISC 303, using nylon-type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Comply with Section 05 1200, except as amended in this section for aesthetic purposes.
- B. Comply with AISC 303, Section 10 for specific AESS category designated on drawings.
- C. Sustainable Design Requirements:
 - 1. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Recycled Content: Provide W-shape, channel and angle shapes steel with minimum 90 percent total recycled content including at least 60 percent post-consumer recycled content, except as follows.
 - a. Plate and Bar: Minimum 30 percent total recycled content.
 - b. Cold-Formed Hollow Structural Sections: Minimum 30 percent total recycled content.
 - c. Steel Pipe: Minimum 30 percent total recycled content.
 - d. All Other Steel Materials: Minimum 30 percent total recycled content.

2.2 FABRICATION

- A. Fabricate and assemble AESS in shop to greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Architect. Detail AESS assemblies to minimize field handling and expedite erection. Comply with the additional requirements:
 - 1. Exposed surfaces shall be smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
 - 2. Exposed surfaces shall be free of mill marks, including rolled trade names and stamped or raised identification.
 - 3. Exposed surfaces shall be free of seams to the maximum extent possible.
 - 4. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and edges.
 - 5. Remove blemishes by filling or grinding, or by welding and grinding, before cleaning, treating, and shop priming.
 - 6. Piece marks shall be fully hidden in the completed structure or made with media that permits full removal upon erection.
 - 7. Seal-weld open ends of hollow structural sections with 3/8" (9.5 mm) closure plates.
- B. Permissible tolerances for member depth, width, out of square, and camber and sweep to be as specified in ASTM A6/A6M, ASTM A500/A500M, and ASTM A1085/A1085M.

- C. Use special care in handling and shipping of AESS both before and after shop painting to minimize damage to any shop finish. Use nylon-type slings or softeners when using chains or wire rope slings.
- D. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8" (3.2 mm) with a tolerance of 1/32" (0.8mm).
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
 - 2. Baseplate holes: Cut, drill, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- F. Bolted Connections:
 - 1. Make in accordance with Section 05 1200. Provide bolt type and finish as noted herein.
 - 2. Bolt holes: Cut, drill, mechanically thermal cut (if applied by Architect), or punch standard bolt holes perpendicular to steel surfaces.
 - 3. High-Strength Bolt-Nut-Washer Assemblies: ASTM A325, Type 1, heavy hex-head assemblies, consisting of steel structural bolts with heavy hex, carbon-steel nuts, and hardened carbon-steel washers.
 - a. Finish: Plain
 - b. Joint Type: Snug tightened.
- G. Welded Connections:
 - 1. Comply with AWS D1.1/D1.1M and Section 05 1200.
 - 2. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding tolerances of this section.
 - 3. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
 - 4. Provide continuous, sealed welds at an angle to gusset-plate connections and similar locations where AESS is exposed to weather.
 - 5. Provide continuous welds of uniform size and profile.
 - 6. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16" (1.5 mm), minus 0" (0 mm) for AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
 - 7. Remove backing bars or run-off tabs; back-gouge and grind steel smooth.
 - 8. at locations where welding on the far side of an exposed connection of AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
 - 9. Make fillet welds of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to as needed for correction of unacceptable work.
- H. Surface Preparation:
 - 1. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 - a. Provide polyester filler intended for use in repairing dents in automobile bodies to repair scratches, dents, and other surface abnormalities.
 - 2. Remove backing and run out tabs.
- I. Fabricate AESS in accordance with categories defined in AISC 303, as follows:
 - 1. AESS 1: Basic elements.
 - 2. AESS 2: Feature elements viewed at a distance greater than 20 feet (feature elements not in close view).

2.3 PAINT SYSTEM

- A. Compatibility: All components/procedures of AESS paint system to comply with coating system specified, submitted, and approved per Sections 09 9600. As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating, and finish coating to be from a single manufacturer combined in a system documented by manufacturer with adequate guidance for fabricator to procure and execute.
- B. Primer: As specified in Sections 09 9600. Primer to comply with all federal standards for VOC, lead and chromate levels.

2.4 SHOP PRIMING

- A. Surface Preparation:
 - 1. Provide surface preparations to meet SSPC-SP 6.
 - 2. Coordinate required surface profile with approved paint submittal prior to beginning surface preparation.
 - 3. Prior to blasting, remove any grease and oil using solvent cleaning to meet SSPC-SP 1.
 - 4. Remove weld spatter, slivers and similar surface discontinuities.
 - 5. Ease sharp corners resulting from shearing, flame cutting or grinding.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted with slip-critical connections.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by hot-dip process to AESS indicated for galvanizing according to ASTM A123/A123M. Fabricate such that all connections of assemblies are made in the field with bolted connections where possible.

2.6 MATERIALS

- A. General: Meet requirements of 05 1200 as amended below.
- B. Tension Control, High-Strength Bolts, Nuts, and Washers: Per section 05 1200, Tension Control Bolts. Provide standard carbon steel finish rounded bolt heads with twist off bolts; ASTM F3125/F3125M.

2.7 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 - 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 1200 for additional requirements.
- C. AESS 1 and 2 Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erector to check all AECS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of appearance of member. Coordinate remedial action with fabricator prior to erecting steel.

3.2 PREPARATION

- A. Provide connections for temporary shoring, bracing and supports only where noted on approved fabrication documents. Temporary connections not shown are to be made at locations not exposed to view in final structure or as approved by Architect.
- B. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain appearance of AECS through process of erection.

3.3 ERECTION

- A. AECS 1 and 2: Basic elements; feature elements not in close view:
 - 1. Employ special care to handle and erect AECS. Erect finished pieces using nylon straps or chains with softeners such that they are not damaged.
 - 2. Place weld tabs for temporary bracing and safety cabling at points concealed from view in completed structure or where approved by Architect during pre-installation meeting. Obtain Architect approval of methods for removing temporary devices and finishing AECS members prior to erection.
 - 3. AECS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of AISC 303.
 - 4. Set AECS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
 - 5. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 - 6. Remove all backing and run out tabs.
 - 7. When temporary braces or fixtures are required to facilitate erection, take care to avoid any blemishes, holes or unsightly surfaces resulting from use or removal of such temporary elements.
 - 8. Bolted Connections: Align bolt heads on same side of connection as indicated on approved fabrication or erection documents.
 - 9. Welded Connections: Comply with AWS D1.1/D1.1M and Section 05 1200. Appearance and quality of welds to be consistent. Employ methods that will maintain alignment of members without warp exceeding tolerance of this section.
 - 10. Remove weld spatter exposed to view.
 - 11. Grind off projections larger than 1/16 inch at field butt and plug welds.
 - 12. Continuous Welds: Where continuous welding is noted on drawings, provide continuous welds of a uniform size and profile.
 - 13. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
 - 14. Splice members only where indicated.
 - 15. Obtain permission for any torch cutting or field fabrication from Architect. Finish sections thermally cut during erection to a surface appearance consistent with mock-up.

3.4 FIELD QUALITY CONTROL

- A. Structural Requirements:
 - 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 1200 for additional requirements.
- B. AESS 1 and 2 Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

3.5 CLEANING

- A. Touch-up Painting: Complete cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint to blend with adjacent surfaces of AESS. Perform touch-up work in accordance with manufacturer's instructions and as specified in Section 09 9600.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas. Repair galvanized surfaces in accordance with ASTM A780/A780M.

END OF SECTION

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. K-series steel joist substitutes.
 - 3. LH- and DLH-series long-span steel joists.
 - 4. Joist accessories.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.

- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications".
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications".
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Floor Joists: Vertical deflection of 1/240 (total load) of the span.
 - b. Roof Joists: Vertical deflection of 1/240 (total load) of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.

- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications".
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
 - 1. Joist Type: LH-series steel joists and DLH-series steel joists.
 - 2. End Arrangement: Underslung.
 - 3. Top-Chord Arrangement: As indicated.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber long-span steel joists according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Detail and fabricate according to SJI's "Specifications". Furnish additional erection bridging if required for stability.

- C. Fabricate steel bearing plates from ASTM A 36 steel with integral anchorages of sizes and thicknesses indicated.
- D. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."
- E. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
 - 1. Finish: Plain, uncoated.
- F. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- G. Welding Electrodes: Comply with AWS standards.
- H. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- I. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
- D. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting". Section 099600 "High-Performance Coatings".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.

- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications", joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds according to AWS D1.1.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1 and the following procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting". Section 099600 "High-Performance Coatings".
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Acoustical cellular roof deck.
 - 3. Composite floor deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
 - 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck, from ICC-ES.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

- C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 - 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
 - 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33 G90 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 - 4. Deck Profile: As indicated.
 - 5. Profile Depth: As indicated.
 - 6. Design Uncoated-Steel Thickness: As indicated.
 - 7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.

8. Span Condition: As indicated.
9. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACOUSTICAL ROOF DECK

- A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
 4. Deck Profile: As indicated.
 5. Cellular Deck Profile: As indicated, with bottom plate.
 6. Profile Depth: As indicated.
 7. Design Uncoated-Steel Thickness: As indicated.
 8. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 9. Span Condition: As indicated.
 10. Side Laps: Overlapped or interlocking seam at Contractor's option.
 11. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
 12. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 - a. Factory install sound-absorbing insulation into cells of cellular deck.
 - b. Installation of sound-absorbing insulation is specified.
 13. Acoustical Performance: As indicated, tested according to ASTM C423.

2.4 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008, Structural Steel (SS), Grade 50 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray baked-on, rust-inhibitive primer.
 2. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G60 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard gray baked-on, rust-inhibitive primer.

4. Profile Depth: As indicated.
5. Design Uncoated-Steel Thickness: As indicated.
6. Span Condition: As indicated.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: ASTM A 780.
- M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum butted at Contractor's option.

- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: As indicated.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds as indicated.
 - 3. Weld Spacing: Space and locate welds as indicated.
 - 4. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.
- F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.
 - 3. Ceiling joist framing.
 - 4. Soffit framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.

- E. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 (flexible finishes) or 1/600 (brittle finishes) of the wall height.
 - b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - c. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

- a. Upward and downward movement of 1 inch.
- 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.
 - 3. Headers: AISI S212.
 - 4. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 33 for minimum uncoated steel thickness of 0.0428 inch and less; 50 for minimum uncoated steel thickness of 0.0538 inch and greater.
 - 2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches, minimum.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
 2. Inner Track: Of web depth indicated.
- F. head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance.
 2. Flange Width: 1-5/8 inches, minimum.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass and head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
 2. Inner Track: Of web depth indicated.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by structural performance.
 2. Flange Width: 1-5/8 inches, minimum.

2.6 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by structural performance.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole-reinforcing plates.
 - 11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308 as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5, unless otherwise indicated.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
 - 2. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing and/or infill studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
 - 2. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.8 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Prefabricated ladders and ship ladders.
- B. Ladder safety systems.
- C. Downspout boots.
- D. Bollards
- E. Loose bearing and leveling plates.
- F. Supplemental framing for suspended stage curtains and rigging.
- G. Miscellaneous trim.

1.2 REFERENCE STANDARDS

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- B. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- L. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- M. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- N. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- O. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- P. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric).
- Q. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- R. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric).
- S. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- T. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- U. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- W. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- X. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- Y. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- Z. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- AA. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements.
 - 1. MR Credit 3: BDPO - Sourcing of Raw Materials
 - a. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gages.
 - 4) Details of connections.
 - 5) Support reactions.
 - 6) Bracing requirements.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4 QUALITY ASSURANCE

- A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- K. Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.

2.2 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Stainless steel.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.3 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

- A. Roof Access Ladders: Aluminum; in compliance with ANSI A14.3; with mounting brackets and attachments; mill finish.
 - 1. Side Rails: 3/8 x 2 inches members spaced at 24 inches.
 - 2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
 - 3. Space rungs 7 inches from wall surface.
- B. Bollards: Galvanized steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
- C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- D. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.
- E. Steel elevator pit ladder; prime paint finish.
- F. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.
- G. Angles, Channels, and Plates for the following applications:
 - 1. Elevator door sill support.
 - 2. Wall protection.
 - 3. Curtainwall insulation angle supports for UL assembly.
 - a. Galvanized.
 - b. Prime paint finish.
 - 4. Curtainwall and storefront head, sill, and jamb locations as shown on the drawings and as required by design loads.
 - a. Galvanized.
 - b. Prime paint finish.

- H. Supplemental framing for stage equipment; prime paint finish.
- I. Cast iron metal stair nosings.
 - 1. Cast into monolithic concrete stairs where indicated on drawings.

2.5 PREFABRICATED LADDERS

- A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
 - 3. Finish: Mill finish aluminum.
 - 4. Manufacturers (Roof Ladder):
 - a. Industrial Ladder & Scaffolding, Inc.; ALACCBP: www.anyladder.com.
 - b. O'Keeffe's Inc: Model 502: www.okeeffes.com.
 - c. Alaco Ladder Company: Model 561: www.alacoladder.com.

2.6 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for AESS finish.
- B. Prime Painting: One coat.
- C. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.7 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 05 5100 - METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Prefabricated stairs.
- C. Structural steel stair framing and supports.
- D. Handrails and guards.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- J. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
- K. 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.
- L. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- M. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

- N. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- O. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- P. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- Q. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- R. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- S. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- T. ICC (IBC) - International Building Code.
- U. NAAMM AMP 510 - Metal Stairs Manual.
- V. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- W. SSPC-SP 2 - Hand Tool Cleaning.

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. 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. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Welders' Certificates.
- E. Designer's Qualification Statement.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
 - 2. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

PART 2 PRODUCTS

2.1 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. 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: Fluid-applied resinous flooring..
- 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: 10 inches.
 - 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Railings: Steel pipe railings.
- G. Finish: Shop- or factory-prime painted.

2.3 PREFABRICATED STAIRS

- A. Modular Egress and Access Stairs: Standardized, modular stair components designed with manufacturer's standard stair angle and height charts; to be field assembled with mechanical fasteners only.
 - 1. Design Requirements: Comply with structural design criteria stated elsewhere in this section and the applicable requirements of ASTM E985.
 - a. Comply with ADA Standards.
 - b. Comply with applicable sections of the IBC.
 - 2. Materials: Manufacturer's standard steel tubes, plates, bars, shapes, sheets, wire and mesh complying with the requirements of the MATERIALS article of this section.
 - a. Treads: Manufacturer's standard concrete pan.
 - 3. Assembly Option: Shipped unassembled.

2.4 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: As specified in Section 05 5213.
- B. Guards: Pipe railings as specified in Section 05 5213.

2.5 MATERIALS

- A. Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.
- B. Steel Sections: ASTM A 36/A 36M.
- C. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- D. Concrete Fill: Type specified in Section 03 3000.

2.6 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

- C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.7 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.

3.3 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- E. Obtain approval prior to site cutting or creating adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

END OF SECTION

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.
- D. Balcony railings and guardrails.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- H. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. 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. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Designer's Qualification Statement.

D. Fabricator's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
- C. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
 - 2. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

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. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- E. Provide slip-on non-weld mechanical 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.
- F. Recycled Content: Provide steel with minimum 25 percent total recycled content including at least 10 percent post-consumer recycled content.

2.2 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.
- B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Galvanizing: In accordance with requirements of ASTM A123/A123M for exterior assemblies.

- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.3 STAINLESS STEEL RAILING SYSTEM

- A. Tubing: ASTM A554, Grade MT 304
- B. Exposed Fasteners: No exposed bolts or screws
 - 1. Material for exterior locations where stainless steel is indicated:
 - a. Alloy Group 1 (A1) or Group 2 (A4) stainless steel bolts: ASTM A593/ASTM F738M.
 - b. Alloy Group 1 (A1) or Group 2 (A4) stainless steel nuts: ASTM F593/ASTM F836M.

2.4 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. 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.

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 7300 - DECORATIVE METAL RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stainless-steel decorative railings.

1.2 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.3 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- E. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- H. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- I. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- J. ASTM E894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
- K. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- L. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.
- M. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

- N. ASTM F594 - Standard Specification for Stainless Steel Nuts.
- O. ASTM F836M - Standard Specification for Style 1 Stainless Steel Metric Nuts (Metric).
- P. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- Q. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- R. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- S. FSC STD-01-001 - FSC Principles and Criteria for Forest Stewardship.
- T. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- U. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- V. NAAMM (MFPM) - Metal Flagpole Manual.
- W. NOMMA - National Ornamental & Miscellaneous Metals Association.
- X. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, and attachment details.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Samples for Verification: For each type of exposed finish required.
 - 1. Sections linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.

3. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Samples need not be full height.
- F. Design Calculations Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

- A. Installer Requirements: Installed by manufacturer or manufacturer certified installer.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.3/D1.3M, "Structural Welding Code - Stainless Steel."
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockups as a tabletop or cut-down version.
 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Stainless-Steel Decorative Railings:
1. Basis-of-Design Product: Subject to compliance with requirements, provide VIVA Railings, LLC Carrollton, TX 972-353-8482 info@vivarailings.com www.vivarailings.com; Panel Pattern PP-05 or comparable product by one of the following:
 - a. Blum, Julius & Co., Inc.
 - b. Morse Industries.
 - c. Tri Tech, Inc.
 - d. Wylie Systems.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 01 6000 "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. Structural Lasercut Panels: Stainless Steel.

2.2 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
 - 2. Stainless Steel: 60 percent of minimum yield strength.
- B. Structural Performance: Railings, including attachment to building construction, shall 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.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
 - 1. Provide cast-stainless steel wall brackets with flange tapped for concealed anchorage with vertical and horizontal adjustment capability.

2.4 LASERCUT STRUCTURAL PANELS

- A. Recycled Content of Stainless Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.
- B. Stainless Steel: ASTM A240/A240M, Grade MT 304, 0.078-inch (2mm).
- C. Aluminum: AA5052-H32, 0.118-inch (3mm).
- D. Steel: ASTM A1008/A1008M, Type B, 0.078-inch (2mm).
- E. Pattern: VIVA Pattern PP-05.

2.5 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Aluminum Components: Type 304 stainless-steel fasteners.
 - 2. Stainless-Steel Components: Type 304 stainless-steel fasteners.

3. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 4. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating.
 5. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
1. Provide hex or hex socket or hex button head machine screws for exposed fasteners unless otherwise indicated.
- 2.6 ICC-ES AC193 IS FOR MECHANICAL ANCHORS AND ICC-ES AC308 IS FOR ADHESIVE ANCHORS.
- A. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F 738M), and nuts, ASTM F594 (ASTM F836M).

2.7 MISCELLANEOUS MATERIALS

- A. Stainless Steel Handrail.
1. Tubing: ASTM A554, Grade MT 304
 2. Handrail Profile and size: As indicated on drawings
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form work true to line and level with accurate angles and surfaces.
- F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H. Connections: Fabricate railings with welded connections unless otherwise indicated.
- I. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- J. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- K. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- L. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending.
 - 3. By flush bends.
 - 4. By radius bends of radius indicated.
 - 5. By bending to smallest radius that will not result in distortion of railing member.
- M. 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.
- N. Close exposed ends of hollow railing members with prefabricated end fittings.

- O. 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.
- P. 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 to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- Q. 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.
- R. 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.
- S. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- T. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM (MFPMP)'s "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.10 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. Circumferential grain for any round tubing.

- C. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As indicated by manufacturer's designations.
- D. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 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.
 - 1. Color and Gloss: As indicated by manufacturer's designations.
- E. Colored Electroplating (ECM)
- F. When polishing is completed, rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mechanical Finish: AA-M3x; sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- D. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: Champagne.
 - 2. Color: Match Architect's sample.
- E. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As indicated by manufacturer's designations.
- F. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 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.
 - 1. Color and Gloss: As indicated by manufacturer's designations.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Contractor to examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.
- B. Installation Tolerances: Structural steel and concrete slabs to be within 1/8 inch (3 mm) in 10 ft (3.048 m) horizontally and 1/8 inch (3 mm) vertically. Correct conditions out-of-tolerance to meet railing manufacturer's requirements.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes in accordance with engineering requirements for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

- D. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 2. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.
- C. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
 - 6. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E894 and ASTM E935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. Clean wood rails by wiping with a damp cloth and then wiping dry.
- D. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- E. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."
- F. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rough opening framing for doors, windows, and roof openings.
- B. Sheathing.
- C. Subflooring.
- D. Roof-mounted curbs.
- E. Roofing nailers.
- F. Roofing cant strips.
- G. Preservative treated wood materials.
- H. Fire retardant treated wood materials.
- I. Miscellaneous framing and sheathing.
- J. Communications and electrical room mounting boards.
- K. Concealed wood blocking, nailers, and supports.
- L. 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.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood.
- G. ICC (IBC) - International Building Code.
- H. PS 1 - Structural Plywood.
- I. PS 2 - Performance Standard for Wood-Based Structural-Use Panels.

J. PS 20 - American Softwood Lumber Standard.

K. SPIB (GR) - Grading Rules.

1.3 SUBMITTALS

- A. Product Data: Provide technical data on sheathing materials and fire retardent treatment of applicable materials. .
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC Chain-of-Custody (CoC) certificates.
 - 2. MR Credit 4: BPDO – Material Ingredients
 - a. For treated wood provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Southern Pine, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.
- C. Sustainable Design Requirements:

1. Forest Certification: Provide wood products made from forests certified by an FSC-accredited certification body. All non-FSC wood in assemblies with FSC-certified wood shall meet the FSC Controlled Wood (CW) criteria.
2. For interior wet-applied coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2–2017 and VOC content in g/L. Include volume of material applied per product.
3. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.
 3. Provide fire retardant treated wood for blocking.

2.3 CONSTRUCTION PANELS

- A. Wall Sheathing: Any APA-PRP108, PS1 type rated sheathing.
 1. Bond Classification: Exterior.
 2. Grade: Sheathing.
 3. Span Rating: 32/16
 4. Performance Category: 15/32 PERF CAT.
 5. Edge Profile: Square edge.
- B. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
 1. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Edges: Square.
 4. Manufacturers:
 - a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
 - c. _____.
- C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- D. Other Applications:
 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior classification.
 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 3. Other Locations: PS 1, C-D Plugged or better.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Sill Flashing: As specified in Section 07 6200.
- C. Water-Resistive Barrier: As specified in Section 07 2500.

2.5 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A 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 AWP A standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWP A U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Do not use treated wood in direct contact with the ground.
 - 2. Interior Type A: AWP A U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches above grade.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.5 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
- C. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs as recommended by manufacturer.
 - 1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
 - 2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
 - 3. Use only mechanically attached and drainable EIFS and exterior insulation with wall sheathing with laminated water-resistive and air barrier.
 - 4. Apply manufacturer's standard seam tape to joints between sheathing panels. Use tape gun or hard rubber roller as recommended by manufacturer.

3.6 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Cabinet hardware.
- C. Preparation for installing utilities.

1.2 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program, www.awiqcp.org.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association (ANSI/BHMA A156.9).
- D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association.

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For composite wood: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For certified wood: Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For composite wood and plastic finishes provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For composite wood installed within the building interior: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
- B. Materials for the educational environment must be designed, engineered, constructed, and installed to meet the intended use and expected abuses of that environment. The primary intent of this specification, applicable drawings, and schedules is to define the minimum requirements of material quality, construction, finish, and overall workmanship to be provided. The finished product shall be functional, provide long life with minimum maintenance, and be operationally safe.

1.5 MOCK-UP

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.7 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.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets at custom locations:
 - 1. Finish - Exposed Interior Surfaces: Decorative laminate.
 - 2. Finish - Concealed Surfaces: Decorative laminate.
 - 3. Adjustable Shelf Loading: 50 lbs. per sq. ft..
 - 4. Cabinet Doors and Drawer Fronts: Flush style.
 - 5. Drawer Side Construction: Multiple-dovetailed.
 - 6. Drawer Construction Technique: Dovetail joints.

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. 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. Composite Wood
 - 1. Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. For recycled content composite wood: Documentation indicating percentages by weight pre-consumer and post-consumer recycled content. Include material cost value.

2.3 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation; Product ____: www.formica.com.
 - 2. Panolam Industries International, Inc\Nevamar; Product ____: www.nevamar.com.
 - 3. Wilsonart International, Inc; Product ____: www.wilsonart.com.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.4 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Architect from manufacturer's standard range.
 - 2. Use at all exposed plywood edges.
 - 3. Use at all exposed shelf edges.

2.5 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.
 - 1. Individual rooms to be keyed alike.

2.6 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Provide cutouts for all penetrations.. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.

3.3 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 0553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 REFERENCE STANDARDS

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

1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- B. Schedule: Completely define scope of proposed marking. Indicate location of affected walls and partitions, and number of markings.
- C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 FIELD CONDITIONS

- A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
- B. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 9123 for products.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

- A. See Section 09 9000 - Painting and Coating for substrate preparation.

3.3 INSTALLATION

- A. Locate markings as required by ICC (IBC).
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 1400 - FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-Applied Waterproofing:
 - 1. Fluid Applied membrane waterproofing.
 - 2. Below-grade waterproofing accessories.
 - 3. Polyurethane waterproofing.

1.2 REFERENCE STANDARDS

- A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- C. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- D. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- F. NRCA (WM) - The NRCA Waterproofing Manual.

1.3 SUBMITTALS

- A. Product Data: Provide data for membrane.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 4: BPDO – Material Ingredients
 - a. For waterproofing: Material Ingredient Report.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

1.6 WARRANTY

- A. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no cost to Owner.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.1 WATERPROOFING APPLICATIONS

- A. Polyurethane Waterproofing:
 - 1. Location: Foundation walls and elevator pit.
 - 2. Cover with drainage panel.

2.2 FLUID APPLIED WATERPROOFING MATERIALS

- A. Sustainable Design Requirements:
 - 1. Provide material ingredient report.
- B. Polyurethane Waterproofing: Cold-applied one component polyurethane, complying with ASTM C836/C836M.
 - 1. Cured Thickness: 120 mils, 0.12 inch, minimum.
 - 2. Suitable for installation over concrete substrates.
 - 3. VOC Content: None.
 - 4. Tensile Strength: 400 psi, measured in accordance with ASTM D412.
 - 5. Ultimate Elongation: 500 percent, measured in accordance with ASTM D412.
 - 6. Durometer Hardness, Type A: 30, minimum, in accordance with ASTM D2240.
 - 7. Adhesion: Greater than 150 psi, measured in accordance with ASTM D4541.
 - 8. Brittleness Temperature: Based on minus 50 degrees F, measured in accordance with ASTM D746.
 - 9. Products:
 - a. Carlisle Coatings & Waterproofing, Inc; CCW 703 Liquiseal: www.carlisleccw.com/#sle.
 - b. Gaco Western; GacoFlex LM-60: www.gaco.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; TREMproof 250GC: www.tremcosealants.com/#sle.
- C. Flexible Flashings: Type recommended by membrane manufacturer.

2.3 ACCESSORIES

- A. Sealant for Joints and Cracks in Substrate: Type compatible with waterproofing material and as recommended by waterproofing manufacturer.
- B. Protection Board: Rigid insulation specified in Section 07 2100.
- C. Drainage Panel: 1/4 inch thick formed plastic, hollowed sandwich.
- D. Cant Strips: Premolded composition material.

- E. Counterflashings: As recommended by membrane and protection board manufacturer.
- F. Termination Strip: As recommended by membrane manufacturer.
- G. Expansion Joint: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.
- C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.
- D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.
- C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.
- D. Install cant strips at inside corners.

3.3 INSTALLATION

- A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.
- B. Seal membrane and flashings to adjoining surfaces.

3.4 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward, and scribe and cut boards around projections, penetrations, and interruptions.
- B. Place protection board directly against drainage panel; butt joints, and scribe and cut boards around projections, penetrations, and interruptions.

3.5 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation at cavity wall construction and perimeter foundation wall.
 - 1. NOTE: Refer to section 07 5400 for roof insulation.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.
- H. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Require attendance by installers of other adjacent construction including, but not limited to, roofing, waterproofing, masonry, wall panels, sealants, windows/storefronts/curtain walls, door frames, and weather/air barriers.
 - 3. Include manufacturer's representative to review storage and handling procedures.
 - 4. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 5. Review procedures for protection of work and other construction.

1.4 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, product limitations, and compatibility with adjacent materials.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For insulation: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - b. For manufacturers with extended producer responsibility programs: Documentation describing the program and confirmation that product is included in the program.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For insulation provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.
- G. Refer to Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.5 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacturing. Use secondary materials approved in writing by primary material manufacturer.

1.6 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation Inside Masonry Cavity Walls: Mineral fiber board.
- C. Insulation Over Metal Stud Framed Walls, Continuous: Mineral fiber board.
- D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.
- E. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.2 SUSTAINABLE DESIGN REQUIREMENTS

- A. Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
- B. For recycled content insulation: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Provide Material Ingredient Report.
- D. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.

2.3 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Perimeter of Foundations, Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value: minimum 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
 - 5. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
 - 7. Manufacturers:
 - a. Dow Chemical Company; STYROFOAM HIGHLOAD 40:
www.dowbuildingsolutions.com/#sle.
 - b. Kingspan Insulation LLC; GreenGuard XPS TYPE IV 25 PSI:
www.trustgreenguard.com/#sle.
 - c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation:
www.ocbuildingspec.com/#sle.

2.4 FIBERBOARD INSULATION MATERIALS

- A. Mineral Fiberboard Insulation: Rigid or semi-rigid mineral fiber, ASTM C612 or ASTM C553; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 - 1. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 2. Board Thickness: 3 inches.
 - 3. Thermal Resistance: R-value of 13 (min).
 - 4. Maximum Density: 8.0 pounds per cubic foot, nominal.
 - 5. Manufacturers:
 - a. Johns Manville; CladStone Water & Fire Block Insulation: www.jm.com/#sle.
 - b. Thermafiber, Inc; RainBarrier: www.thermafiber.com/#sle.
 - c. ROCKWOOL (ROXUL, Inc); CAVITYROCK: www.rockwool.com/#sle.

2.5 BATT INSULATION MATERIALS

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 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. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 - 4. Formaldehyde Content: Zero.
 - 5. Manufacturers:
 - a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
 - b. Johns Manville; _____: www.jm.com/#sle.
 - c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

2.6 ACCESSORIES

- A. Sheet Vapor Retarder: Specified in Section 07 2500.
- B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.
- C. Insulation Fasteners: Appropriate for purpose intended.
 - 1. Length as required for thickness of insulation material and penetration of deck substrate.
- D. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.
- E. Adhesive: Type recommended by insulation manufacturer for application.

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 and adhesive.
- 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. Install boards horizontally on foundation perimeter.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install rigid insulation directly to steel studs or exterior grade sheathing at 16 inches on center with manufacturer recommended mechanical fasteners, and tape joints with manufacturer's minimum 4 inch wide sealant tape; comply with ASTM E2357.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.5 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.

3.6 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.

3.7 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.
- B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.
- C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2 DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
 - 1. Water Vapor Permeance: For purposes of conversion, $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$.
- D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.3 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- C. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- D. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
- E. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- H. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Require attendance by installers of other adjacent construction including, but not limited to, roofing, waterproofing, masonry, insulation, wall panels, sealants, windows/storefronts/curtain walls, and door frames.
 - 3. Include weather barrier manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
 - 4. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 5. Review procedures for protection of work and other construction.

1.5 SUBMITTALS

- A. Product Data: Provide data on material characteristics.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For air / vapor barriers provide Material Ingredient Report.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation.
- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. Refer to Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7 MOCK-UP

- A. Install air barrier, vapor retarder, and water-resistive barrier materials in mock-up specified in Section _____.

1.8 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

- A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
- B. Air Barrier:
 - 1. On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
 - 2. On outside surface of sheathing of exterior walls use air barrier coating.
- C. Sustainable Design Requirements:
 - 1. Provide Material Ingredient Report

2.2 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier Sheet, Self-Adhered:
 - 1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
 - 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
 - 5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 - 6. Manufacturers:
 - a. Carlisle Coatings and Waterproofing, Inc; Fire Resist 705 VP: www.carlisleccw.com/#sle.
 - b. Henry Company; Blueskin VP160: www.henry.com/#sle.
 - c. W.R. Meadows, Inc; Air-Shield: www.wrmeadows.com/#sle.
- B. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 - 1. Air Permeance: 0.001 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to six months of weather exposure after application.
 - 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 5. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - 6. Manufacturers:
 - a. Dow Chemical Company; Defend Air 200: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. DuPont Building Innovations; Tyvek Fluid Applied WB with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System and StraightFlash: www.dupont.com/#sle.
 - c. Henry Company; Air-Bloc 17MR: www.henry.com/#sle.

2.3 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
- E. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
 - 3. Use flashing to seal to adjacent construction and to bridge joints.
- F. Openings and Penetrations in Exterior Weather Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
 - 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.
- B. Do not cover installed weather barriers until required inspections have been completed.
- C. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- E. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air-barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed.
 - 7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Air barrier has been firmly adhered to substrate.
 - 10. Compatible materials have been used.
 - 11. Transitions at changes in direction and structural support at gaps have been provided.
 - 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 13. All penetrations have been sealed.
- F. Tests: As determined by Owner's testing agency from among the following tests:
 - 1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
 - 2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E783.
 - 3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 16 lbf/sq. in. (110 kPa) according to ASTM D4541 for each 600 sq.ft. (56 sq. m) of installed air barrier or part thereof.
- G. 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 at no additional cost to the Owner.
- H. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.5 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4210 - COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Composite framing support (CFS) system with in-fill insulation integrated with wall cladding systems.
 - 1. Substrate: Exterior sheathing over metal stud framing, Concrete masonry units (CMU)

1.2 REFERENCE STANDARDS

- A. ASCE American Society of Civil Engineers (www.asce.org)
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2010 with Supplements and Errata
 - 2. ASCE – Structural Plastics Design Manual
- B. ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers (www.ashrae.org)
 - 1. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013
 - 2. ASHRAE 189.1 – Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings; 2014
- C. ASTM International (American Society for Testing and Materials; www.astm.org)
 - 1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015
 - 2. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2015
 - 3. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013
 - 4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014
 - 5. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Product; 2015
 - 6. ASTM C1177/C1177M – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013
 - 7. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2011
 - 8. ASTM C1396/C1396M – Standard Specification for Gypsum Board; 2014a
 - 9. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010e1
 - 10. ASTM D570 – Standard Test Method for Water Absorption of Plastics; 2010e1
 - 11. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014
 - 12. ASTM D638 – Standard Test Method for Tensile Properties of Plastics; 2014
 - 13. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer; 2008e1
 - 14. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics; 2015
 - 15. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2010

16. ASTM D792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2013
 17. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2013a
 18. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012
 19. ASTM D4385 - Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products; 2013
 20. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a
 21. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2015
 22. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 04(2012)
 23. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013
- D. IBC – International Building Code (International Code Council); 2012
- E. IECC – International Energy Conservation Code; 2015
- F. IgCC – International Green Construction Code; 2012
- G. NFPA – National Fire Protection Association (www.nfpa.org)
1. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012
- H. Voluntary Product Standard; National Institute of Standards and Technology (NIST)
1. PS 1 – Structural Plywood; 2009

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate construction of wall cladding support system over substrate indicated for proper drainage, flashing, trim, back-up support, soffits, and other related Work.
1. Review and finalize construction schedule.
 2. Verify availability of materials, installer's personnel, equipment, and facilities needed to maintain schedule.
 3. Review means and methods related to installation, including manufacturer's written instructions.
 4. Examine support conditions for compliance with requirements, including alignment and attachment to structural support system.
 5. Review flashings, wall cladding details, wall penetrations, openings, and condition of other construction that affects this Work.
 6. Review temporary protection requirements for during and after installation of this Work.
- B. Preinstallation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
1. Require attendance by the installer and relevant sub-contractors.
 2. Require attendance by installers of other adjacent construction.
 3. Include roofing manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.

4. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
5. Review procedures for protection of work and other construction.
6. Review preparation and installation procedures and coordinating and scheduling required with related work.

C.

1.4 SUBMITTALS

- A. Product Data: Submit for each type of product indicated; include construction details, material descriptions, dimensions of individual components and profiles, and accessories as necessary for complete fully functioning and assembled system.
- B. Coordination Drawings: Submit scaled exterior elevations that provide the following items in coordination with each other and with input from installers of these items:
 1. CFS system attachment methods and required fasteners
 2. Sub-framing
 3. Continuous insulation support system attachment methods and required fasteners
 4. Wall-mounted items including doors, windows, louvers, and lighting fixtures
 5. Project specific details of wall penetrations including pipes, electrical fixtures, and any other utilities.
- C. Test and Inspection Reports: Submit test and inspection reports on each type of wall cladding/veneer system based on evaluation of comprehensive tests performed by nationally recognized testing agency.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Refer to Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.
- B. Installer: Company specializing in performing work of this section and the following:
 1. Install system in strict compliance with manufacturer's installation instructions.
 2. Have not less than three years of documented experience.
 3. Factory trained and approved by CFS system manufacturer.
- C. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a licensed Structural Engineer experienced in design for this type of Work and licensed in State that Project is located.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original unopened containers and packaging with labels clearly identifying product name and manufacturer.
- B. Deliver components and other manufactured items or accessories without damage or deformation.

- C. Storage: Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with manufacturer's written instructions.
- D. Protect components and auxiliary accessories during transportation, handling, and installation from moisture, excessive temperatures and other construction operations in accordance with manufacturer's written instructions.
- E. Handle components in strict compliance with manufacturer's written instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface, edge or corner damage.

1.7 SITE CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work in accordance with manufacturer's written installation instructions and warranty requirements.

1.8 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. CFS System Warranty: Provide written warranty by manufacturer agreeing to correct defects in manufacturing within five years after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. System Thermal Design: Ensure installed insulation and CFS system, sub-framing, clips and cladding attachment does not have thermal bridging of fasteners or framing that creates a continuous metal path from exterior surface of insulation to interior face of insulation.
 - 1. System thermal design shall meet or exceed thermal design requirements in compliance with IECC energy code.
 - 2. Thermal Resistance: Wall assembly R Value of 13 cavity, 7.5 continuous.
 - 3. Thermal Performance Test: Provide thermal resistance (R-value) indicated, in compliance with ASTM C1363, corrected to 15 mph outside and still air inside, with installed condition including fastening and joints.
 - a. Provide efficiency of no less than 93 to 98 percent with a maximum temperature differential of 18 degrees F from interior wall surface to interior wall cavity and node locations with a 70 degrees F exterior to interior wall temperature delta.
 - b. Provide test unit with at least one insulation panel horizontal and vertical joint length and height of test chamber area.
 - c. Provide finite element analysis of three dimensional simulation of described wall assembly sealed by professional engineer in compliance with performance requirements and exceeding it by at least 3 percent.
- B. Temperature: Comply with structural loading requirements within temperature range of minus 55 degrees F to 180 degrees F.
- C. Fire-Test-Response Characteristics: Provide composite framing support system with fire-test results indicated as determined by test standard indicated and applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: In compliance with ASTM E84, for foam insulation, fiber reinforced polymer (FRP) and interior surfaces as follows:
 - a. Flame Spread Index (FSI): 25 or less.
 - b. Smoke Developed Index (SDI): 450 or less.
 2. Intermediate Scale Multistory Fire Test: Comply with NFPA 285 and/or IBC acceptance criteria for wall height above grade and fire separation distances, when wall type and other noted conditions require such testing or compliance with requirements as indicated.
- D. Thermal Movement: Provide for free and noiseless movement due to expansion and contraction without deformation of material, opening of joints, unnecessary stress on fasteners, or other effect detrimental to the integrity of the building envelope.
1. Allow for ambient temperature adjustment at the time of fabrication, assembly, and installation activities.

2.2 COMPOSITE FRAMING SUPPORT (CFS) SYSTEM

- A. CFS System: Provide CFS system consisting of polyester and vinyl ester bioresin matrix (FRP) with recycled materials, fire retardant additives and integral continuous metal inserts the length of profile. Reinforce CFS system with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
1. Depth of framing member: As indicated on drawings.
 2. Size of closure angle: As indicated on drawings.
 3. On Center Spacing: As indicated on drawings.
 4. Provide continuous non-corrosive steel insert for engagement of fasteners, at least 16 gage thick with G90 galvanized coating designation in compliance with ASTM A653/A653M.
 - a. Fully engage steel insert with adjacent CFS at ends.
 - b. Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of CFS.
 5. Provide integral compression seal in CFS sections to ensure insulation panel will not dislodge.
 6. Provide integral anti-siphon grooves on exterior and interior flanges of CFS.
 7. Provide force distribution zones integrally designed into profile of CFS.
 8. Surface Burning Characteristics:
 - a. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
 - b. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 9. Flammability: Comply with ASTM E84.
 10. Self-Extinguishing: Comply with ASTM D635.
 11. Profile Visual Requirements: Comply with ASTM D4385.
 12. Tensile Stress: Provide engineered lengthwise and crosswise tensile stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D638.
 13. Compressive Stress: Provide engineered lengthwise and crosswise compressive stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D695.
 14. Flexural Stress: Provide engineered lengthwise and crosswise flexural stress in compliance with performance loading criteria and specified safety factors, in accordance with ASTM D790.
 15. Modulus of Elasticity: Engineered to meet performance loading criteria and specified safety factors.
 16. Barcol Hardness: 45, in accordance with ASTM D2583.

17. Water Absorption: Less than 0.46 percent by weight, within 24 hours, tested in accordance with ASTM D570.
18. Density: Within range of 0.062 to 0.070 lbs/cubic inch, in accordance with ASTM D792.
19. Lengthwise Coefficient of Thermal Expansion: 7.0×10^{-6} inch/inch/degrees F, in accordance with ASTM D696.
20. Notched Izod Impact, Lengthwise: 24 ft lbs/inch, in accordance with ASTM D256 within temperature range indicated.
21. Notched Izod Impact, Crosswise: 4 ft lbs/inch, in accordance with ASTM D256 within temperature range indicated.

2.3 ASSEMBLY

- A. Assemble CFS system using manufacturer's standard procedures and processes identical to tested units and as necessary to comply with performance requirements indicated.
 1. Comply with CFS system and dimensional and structural requirements as indicated on drawings.
 2. Erect CFS system in established sequence in accordance with manufacturer's standard installation procedures.
 3. Provide spray foam sealant on backside of cantilevered fasteners that completely puncture insulation layer.

2.4 ACCESSORIES

- A. Provide accessories necessary for complete CFS system.
- B. Fasteners: Corrosion-resistant, self-tapping and self-drilling screws, bolts, nuts, and other fasteners as recommended by CFS system manufacturer for project application.
 1. Cladding to CFS System: Use standard self-tapping metal screws.
 2. CFS System to Metal Stud Wall Framing: Use standard self-tapping metal screws.
 3. CFS System to Concrete/CMU: Use standard masonry or concrete screw anchors in predrilled hole.
 4. DO NOT USE powder, air, or gas actuated fasteners or actuated fastener tools. DO NOT USE impact wrenches when fastening to or from the CFS.
- C. Wall Sheathing: Refer to drawings for thickness and Section 06 1000 for additional requirements.
- D. Weather Resistant Barrier (WRB): Refer to Section 07 2500 for requirements.
- E. Sealants: Refer to Section 07 9200 for sealant information.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas of this work, and project conditions with installer present for compliance with requirements for installation tolerances, substrates, CFS system conditions, and other conditions affecting performance of this Work.
- B. Examine structural wall framing to ensure that angles, channels, studs, and other structural support members have been installed within alignment tolerances required by CFS system manufacturer.

- C. Examine rough-in for components and systems penetrating CFS system to coordinate actual locations of penetrations relative to CFS systems joint locations prior to installation.
- D. Verify that mechanical and electrical services for exterior walls have been installed and tested and, if appropriate, verify that adjacent materials and finishes are dry and ready to receive insulation.
- E. Proceed with installation only after wall substrate surfaces have been properly prepared and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by CFS manufacturer for achieving best result for substrate under project conditions.
- C. Prepare sub-framing, base angles, sills, furring, and other CFS system members and provide anchorage in accordance with ASTM C754 for substrate type and wall cladding type in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

- A. Install CFS system in accordance with manufacturer's installation instructions.
- B. Install CFS system components vertically or horizontally, as required, to exterior sheathing over metal stud framing or concrete masonry units (CMU).
- C. Install system to fill-in exterior spaces without gaps or voids, and do not compress insulation panels.
- D. Trim insulation neatly to fit spaces, and insulate miscellaneous gaps and voids.
- E. Fit insulation tight in spaces and tight to exterior side of Mechanical/Electrical services within plane of insulation.
- F. Exposed insulation must be protected from open flame.
- G. Exterior wall insulation is not intended to be left exposed for extended periods of time without adequate protection.
- H. Install CFS system in compliance with system orientation, sizes, and locations as indicated on drawings.
- I. Installation shall maintain exterior wall assembly air and water tightness.

3.4 TOLERANCES

- A. Shim and align CFS system within installed tolerances of 1/4 inch in 20 feet, non-cumulative, level, plumb, and on location lines as indicated.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Ensure that insulation panels are not exposed to moisture.
 - 1. Remove wet insulation panels or allow them to completely dry prior to installation of CFS system.
- C. Replace damaged insulation prior to Date of Substantial Completion.

END OF SECTION

SECTION 07 4213.13 - FORMED METAL WALL PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed-fastener, lap-seam metal wall panels.

1.2 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- H. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- I. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- K. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- L. 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.
- M. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- N. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal 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 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 affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For panels provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For panels having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings:
 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
 1. Include Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.
- F. See Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical metal panel assembly as shown on Drawings, including corner, supports, attachments, and accessories.
 - 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.
- E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems 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 and other materials beyond normal weathering.
 - 2. Warranty Period: Two 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 panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sustainable Design Requirements:
 - 1. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Provide panels having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Structural Drawings.
 - 2. Other Design Loads: As indicated on Structural Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. 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 concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Double Reveal Profile, Concealed-Fastener Metal Wall Panels : Formed with a flat pan evenly spaced between reveals.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CENTRIA Architectural Systems.
 - 1) Basis of Design: CS-620
 - b. MBCI.
 - c. PAC-CLAD; Petersen Aluminum Corporation.
 - 2. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.032 inch (0.81 mm).
 - b. Surface: Smooth, flat finish.
 - c. Exterior Finish: Two-coat fluoropolymer.
 - d. Color: As selected by Architect from manufacturer's full range.
 - 3. Panel Coverage: 16 inches (406 mm).
 - 4. Panel Height: 0.875 inch (22 mm).

2.3 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae,

parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 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 (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

- A. Fabricate and finish metal panels and accessories at the factory, 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.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA (ASMM)'s "Architectural Sheet Metal Manual" that apply to 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. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

- a. Size: As recommended by SMACNA (ASMM)'s "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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 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.
- C. Aluminum Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine 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 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.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

- A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. 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 of 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.
- E. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: 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 panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA (ASMM)'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 are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by testing agency for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.
- G. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 4213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.
- B. Matching flashing and trim.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- H. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- I. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- J. ASTM D523 - Standard Test Method for Specular Gloss.
- K. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.
- L. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
- M. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- N. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet.
- O. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

- Q. 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.
- R. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- S. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Require attendance by installers of other adjacent construction including, but not limited to, roofing, waterproofing, masonry, wall panels, sealants, windows/storefronts/curtain walls, door frames, and weather/air barriers.
 - 3. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
 - 4. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 5. Review procedures for protection of work and other construction.

1.4 SUBMITTALS

- A. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 - 2. Storage and handling requirements and recommendations.
 - 3. Fabrication instructions and recommendations.
 - 4. Specimen warranty for finish, as specified herein.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions and recommendations.
 - 4. Specimen warranty for wall system, as specified herein.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For Panels provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For panels having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For panels provide Material Ingredient Report.

- D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.
 - 1. Indicate panel numbering system.
 - 2. Differentiate between shop and field fabrication.
 - 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
 - 4. Include large-scale details of anchorages and connecting elements.
 - 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 - 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- E. Selection Samples: For each finish product specified, submit at least three sample color chips representing manufacturer's full range of available colors and patterns.
 - 1. Sealant Color: Color to match wall panels.
- F. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.
- G. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
- H. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
- I. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
- J. Designer's Qualification Statement.
- K. Manufacturer's Qualification Statement.
- L. Installer's Qualification Statement.
- M. Testing Agency's Qualification Statement.
- N. Maintenance Data: Care of finishes and warranty requirements.
- O. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- P. Refer to Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.5 QUALITY ASSURANCE

- A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing wall panel systems specified in this section.
 - 1. With not less than three years of documented experience.

- C. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Approved by wall panel system manufacturer.
- D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.
- E. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
 - 1. Locate where directed.
 - 2. Provide panels finished as specified.
 - 3. Mock-up may remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect finishes by applying heavy duty removable plastic film during production.
 - 2. Package for protection against transportation damage.
 - 3. Provide markings to identify components consistently with drawings.
 - 4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in well ventilated space out of direct sunlight.
 - 2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
 - 3. Store at a slope to ensure positive drainage of any accumulated water.
 - 4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
 - 5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

- A. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a two year period after Date of Substantial Completion.
- B. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 5 years:
 - 1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
 - 2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
 - 3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Composite Material (MCM) Sheet Manufacturers:
1. 3A Composites USA; Alucobond: www.alucobondusa.com/#sle.
 2. Alcoa, Inc; _____: www.alcoa.com/#sle.
 3. ATAS International, Inc; SterraCore: www.atas.com/#sle.

2.2 WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage or failure.
1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
 2. Provide panel jointing and weatherseal using a "wet", sealant-sealed system.
 3. Anchor panels to supporting framing without exposed fasteners.
- B. Performance Requirements:
1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
 - a. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
 - b. Design Wind Pressure: As specified in Structural Documents.
 - c. Inward Design Wind Pressure: ____ psf as indicated on drawings.
 - d. Outward Design Wind Pressure: ____ psf as indicated on drawings.
 - e. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
 - f. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
 2. Air Infiltration: 0.06 cfm/sq ft of wall area, maximum, when tested at 1.57 psf in accordance with ASTM E283.
 3. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
 - a. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
 - b. Design to drain leakage and condensation to the exterior face of the wall.
- C. Panels: One inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
 2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
 3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.

4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
5. Fabricate panels under controlled shop conditions.
6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
 - a. Make panel lines, breaks, curves and angles sharp and true.
 - b. Keep plane surfaces free from warp or buckle.
 - c. Keep panel surfaces free of scratches or marks caused during fabrication.
8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

2.3 MATERIALS

- A. Sustainable Design Requirements:
 1. Provide product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 2. Provide panels having recycled content: Documentation indicating percentages by weight of pre-consumer and post.
 3. Provide Material Ingredient Report.
- B. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.
 1. Overall Sheet Thickness: 0.118 inch, minimum.
 2. Face Sheet Thickness: 0.019 inches, minimum.
 3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
 4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
 5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
 7. Factory Finish: Two coat fluoropolymer resin coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.
 - a. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.
 - b. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
- C. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
 1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
 2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
 3. Stainless Steel Sheet Components: ASTM A480/A480M.
- D. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; refer to Section 07 6200 for additional requirements.

- E. Anchors, Clips and Accessories: Use one of the following:
 - 1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
 - 2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
 - 3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 10.
- F. Fasteners:
 - 1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
 - 2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
 - 3. Bolts: Stainless steel.
 - 4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.
- G. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.
- H. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine dimensions, tolerances, and interfaces with other work.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturers written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during installation.
- B. Provide anchorage items to be built into masonry to appropriate installer(s) together with setting templates.
 - 1. Refer to Section 04 2000 for additional unit masonry requirements.

3.3 INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Where joints are designed for field applied sealant, seal joints completely with specified sealant.
- H. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.
- I. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
 - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
- J. Replace damaged products.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.
- B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
- C. Site Visits: Schedule two site visits during execution of installation.

3.5 CLEANING

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

3.6 PROTECTION

- A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 4293 - METAL SOFFIT PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal soffit panels.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: Indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.
 - a. Include statement indicating costs for each product having recycled content.
- C. Shop Drawings: Show fabrication and installation layouts of metal soffit panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details specific to project. Distinguish between factory- and field-assembled work.
- D. Samples for Initial Selection: For each type of metal soffit panel indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Metal Soffit Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal soffit panel accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer, Installer, and manufacturer's technical representative.
 - 1. Submit Installer qualifications in the form of an original letter on manufacturer's letterhead signed by authorized manufacturer representative.
- B. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal soffit panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer of plant-fabricated metal soffit panel systems listed in this Section and meeting performance requirements, with a minimum of [five] years'

experience providing metal soffit panel systems for projects of similar type and scope, offering [engineering,]warranty, and technical inspection specified.

- B. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of [five] years' experience installing similar work, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to furnish warranty of type specified.
- C. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer experienced in the installation and maintenance of the specified soffit panel system and qualified to determine Installer's compliance with the requirements of this Project.
- D. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing and inspection indicated.
- E. Source Limitations: Obtain metal soffit panels and accessories [and metal roof and wall panels and accessories] from a single source supplied or approved by metal soffit panel manufacturer.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal soffit panels, and other manufactured items so as not to be damaged or deformed. Package metal soffit panels for protection during transportation and handling.
- B. Unload, store, and erect metal soffit panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal soffit panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal soffit panels to ensure dryness, with positive slope for drainage of water. Do not store metal soffit panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal soffit panel for period of metal soffit panel installation.
- E. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal soffit panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and opening dimensions by field measurements before metal soffit panel fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate metal soffit panel assemblies with roofing and wall work, rain drainage work, flashing, trim, and construction of [girts,] [studs,] soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Air Barrier Coordination: Coordinate installation of soffit panel system with installation of air barrier system wall-to-roof transition material, as required by drawings.

1.10 WARRANTY

- A. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranty on Panel Finishes: Written warranty in which Manufacturer agrees to repair finish or replace metal soffit panels that show evidence of deterioration of factory-applied finishes under normal atmospheric conditions within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers/Products: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. 3A Composites USA; Alucobond Axcent: www.alucobondusa.com/#sle.
 - 2. Alcoa, Inc: www.alcoa.com/#sle.
 - 3. ATAS International, Inc: www.atas.com/#sle.
- B. Soffit Panels shall be provided by same manufacturer as Metal Composite Material Wall Panels for continuity; Refer to section 07 4213.23.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal soffit panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 22 percent.
- C. 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 the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..

- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- E. Structural Performance: Provide metal soffit panel assemblies capable of withstanding the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Drawings.
 - b. Design pressure resulting from wind speed of 90 mph40.2 m/s).
 - 2. Deflection Limits: Metal soffit panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Soffit Panels: Solid panels formed with vertical panel edges and flat pan between panel edges; with flush joint between panels.
 - 1. Basis-of-Design Product: Tremco, Inc. Flush Panel Soffit Panels.
 - 2. Metallic-Coated Steel Sheet: Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Minimum Thickness: 0.0236-inch/24 ga..
 - b. Surface: Smooth, flat finish.
 - c. Exposed Coil-Coated Finish: Two-coat fluoropolymer.
 - d. Color: As selected by Architect from manufacturer's full range.
 - 3. Panel Profile: Flush pan with vents.
 - 4. Panel Coverage: 12 inches.
 - 5. Panel Height: 1 inch.

2.4 ACCESSORIES

- A. Panel Accessories: Provide components required for a complete metal panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal soffit panels, unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal soffit panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal soffit panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- B. Flashing and Trim: Formed from 0.018-inch minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal soffit panels.

2.5 FIELD-INSTALLED THERMAL INSULATION

- A. Refer to Division 07 Section "Thermal Insulation."

2.6 MISCELLANEOUS MATERIALS

- A. Panel 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 soffit panels by means of plastic caps or factory-applied coating. Provide EPDM sealing washers.
- B. Composite Subframing: As specified in section 07 4210.

2.7 FABRICATION

- A. General: Fabricate and finish metal soffit 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. Site-rolled fabrication of panels or shop-rolling of panels using fixed equipment designed for site-rolling applications does not meet the requirements of this Section.
- B. Fabricate metal soffit panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal soffit panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, and that will minimize noise from movements within panel assembly.
- E. 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. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Steel: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal soffit panel manufacturer.

- a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.8 GENERAL FINISH REQUIREMENTS

- 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.

2.9 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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 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.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal soffit panel supports, and other conditions affecting performance of work.
 - 1. Examine 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 soffit panel manufacturer.
 - 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal soffit panel manufacturer.
 - 3. Verify that weather-resistant barrier material has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
 - 4. 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 soffit panels to verify actual locations of penetrations relative to seam locations of metal soffit panels before metal soffit 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 anchorages according to ASTM C 754 and metal soffit panel manufacturer's written recommendations.

3.3 METAL SOFFIT PANEL INSTALLATION

- A. General: Install metal soffit panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor metal soffit panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Commence metal soffit panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
 - 2. Shim or otherwise plumb substrates receiving metal soffit panels.
 - 3. Flash and seal metal soffit panels 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 soffit panels are installed.
 - 4. Install screw fasteners in predrilled holes.
 - 5. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 6. Install flashing and trim as metal soffit panel work proceeds.
 - 7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 8. Apply sealant continuously between metal base channelsill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for weatherproofing.
 - 9. Align bottom of metal soffit panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal soffit panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal soffit panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal soffit panel manufacturer.
 - 1. Seal metal soffit panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal soffit panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
 - a. Sealant in Moving Joints: Elastomeric.
 - b. Sealant in Non-moving Concealed Joints: Butyl.

- E. Lap-Seam Metal soffit panels: Fasten metal soffit 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 corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal soffit 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. Provide sealant tape at lapped joints of metal soffit panels and between panels and protruding equipment, vents, and accessories.
 - 6. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
 - 7. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

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 soffit 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 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 FIELD QUALITY CONTROL

- A. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative acceptable to Owner to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- B. Remove and replace metal soffit panels where inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal soffit panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal soffit panel installation, clean finished surfaces as recommended by metal soffit panel manufacturer. Maintain in a clean condition during construction.
- B. After metal soffit panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal soffit panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 5400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Flashings.
- F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 REFERENCE STANDARDS

- A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- E. NRCA (RM) - The NRCA Roofing Manual.
- F. NRCA (WM) - The NRCA Waterproofing Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Require attendance by installers of other adjacent construction.
 - 3. Include roofing manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
 - 4. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
 - 5. Review procedures for protection of work and other construction.
 - 6. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.4 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
 - 1. Provide documentation that roofing materials are compatible with adjacent materials.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For roofing membrane and insulation provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For TPO having recycled content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For roofing membrane and insulation provide Material Ingredient Report.
- C. Shop Drawings: Submit drawings that indicate project specific joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Manufacturer's Quality Control Program.
- J. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's certification that installation complies with warranty conditions for waterproof membrane.
- K. Refer to Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.7 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 50 degrees F or above a temperature recommended by the manufacturer in degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.8 WARRANTY

- A. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 30 years-no dollar limit.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Exceptions are not Permitted:

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle Roofing Systems, Inc; FleeceBACK Fully Adhered TPO: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products, LLC; UltraPly TPO Platinum: www.firestonebpco.com/#sle.
 - 3. Johns Manville; JM TPO FB 135 TPO: www.jm.com/#sle.
 - 4. Tremco, Inc.; TremPly Max TPO FB Single Ply: www.tremcoroofing.com.

2.2 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:

1. Solar Reflectance Index (SRI): 84, minimum, calculated in accordance with ASTM E1980.
 - a. Field applied coating may not be used to achieve specified SRI.
2. Sustainable Design Requirements:
 - a. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

2.3 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
 - a. Thickness: 80 mil, 0.080 inch, minimum.
 - b. Reinforcing fabric: Fleece backing
 2. Sheet Width: Factory fabricated into largest sheets possible.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
 1. Fire-retardant adhesive.
- D. Flexible Flashing Material: Same material as membrane.

2.4 DECK SHEATHING AND COVER BOARDS

- A. Deck Sheathing and Cover Board: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/2 inch thick.
 1. Manufacturers:
 - a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.
 - b. National Gypsum Company; DEXcell Glass Mat Roof Board: www.nationalgypsum.com/#sle.

2.5 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 1. Classifications:
 - a. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
 - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
 2. Thermal Resistance: R-value of 30 (min).
 3. Manufacturers:
 - a. Dow Chemical Company; TUFF-R: www.dowbuildingsolutions.com.
 - b. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
 - c. Versico, a division of Carlisle Construction Materials, Inc; SecurShield Insulation: www.versico.com/#sle.
 4. Refer to Section 07 2100.

2.6 ACCESSORIES

- A. Prefabricated Roofing Expansion Joint Flashing: As specified in Section 07 7100.

- B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- C. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.
- D. Sheathing Joint Tape: Paper type, 6 inch wide, self adhering.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
- F. Insulation Adhesive: As recommended by insulation manufacturer.
- G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 - 1. Composition: Roofing membrane manufacturer's standard.
 - 2. Size: As indicated.
 - 3. Surface Color: White or yellow.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 METAL DECK PREPARATION

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.

3.3 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.
- G. Membrane and base flashing installation shall remain watertight.
- H. Roofing materials shall be compatible with each other and adjacent materials.

3.4 VAPOR RETARDER AND **INSULATION - UNDER MEMBRANE**

- A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
- B. Attachment of Insulation:
 - 1. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Do not apply more insulation than can be covered with membrane in same day.

3.5 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate required to achieve uplift requirements. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.

- G. Install roofing expansion joints where indicated. Make joints watertight.
 - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- H. Coordinate installation of roof drains and sumps and related flashings.

3.6 FINISHING UNBALLASTED SURFACES

- A. Install walkway pads. Space pad joints to permit drainage.

3.7 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.
- C. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
 - 1. Electric Field Vector Mapping (EFVM): Testing agency shall survey entire roof area for potential leaks using electric field vector mapping (EFVM).
- D. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - 1. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
 - 2. Flood each area for 24 hours.
 - 3. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
- E. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- F. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.8 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

- A. Protect installed roofing and flashings from construction operations.

- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, and other items indicated in Schedule.
- B. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- F. CDA A4050 - Copper in Architecture - Handbook.
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples: Submit two samples ___4_by___4___ inch in size illustrating metal finish color.
- C. See Section 01 9119 - Building Envelope Commissioning for additional submittal requirements.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five (5) years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's full color range (including standard and custom).

2.2 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.3 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Plastic Cement: ASTM D4586/D4586M, Type I.
- F. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 9119 - Building Envelope Commissioning for requirements related to verifying that the installation meets defined objectives and criteria for the building enclosure system.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- C. ITS (DIR) - Directory of Listed Products.
- D. FM 4991 - Approval Standard for Firestop Contractors.
- E. FM (AG) - FM Approval Guide.
- F. SCAQMD 1168 - Adhesive and Sealant Applications.
- G. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- H. UL (FRD) - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For firestopping materials provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For firestopping materials provide Material Ingredient Report.
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.

1.4 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - 3. Verification of minimum three years documented experience installing work of this type.
 - 4. Verification of at least five satisfactorily completed projects of comparable size and type.
 - 5. Licensed by local authorities having jurisdiction (AHJ).

1.5 MOCK-UP

- A. Install one firestopping assembly representative of each fire rating design required on project.
 - 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
 - 2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
- B. If accepted, mock-up will represent minimum standard for the Work.
- C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.6 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products; _____: www.3m.com/firestop/#sle.
 - 2. Hilti, Inc; _____: www.us.hilti.com/#sle.
 - 3. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.

2.2 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Fire Ratings: Refer to drawings for required systems and ratings.

- E. Sustainable Design Requirements:
 - 1. Provide Product-specific declaration or Industry-wide.
 - 2. Provide Material Ingredient Report.

2.3 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
- B. Firestopping Between Edge of Floor Slab and Curtain Wall (without Penetrations): Fiber firestopping with smoke seal coating; UL Design No. CW-D-1014.
 - 1. Fiber Type:
 - a. Formaldehyde free (GREENGUARD Gold Certified).
 - b. EPA Choice Fiber; 75% pre-consumer recycled content per EPA Preference Program.
 - c. Standard Fiber: 70% pre-consumer recycled content.
 - 2. Density: 8 pcf, nominal.
 - 3. R-value: 4.3 per inch.
 - 4. Facing: foil.
 - 5. Surface Burning Characteristics: Meet or exceed ASTM E84.
 - 6. Non-Corrosive when tested in Accordance with ASTM C665
 - 7. UL Certified Environmental Product Declaration in accordance with ISO 14025
 - 8. Basis-of-Design Product: FireSpan 90 as manufactured by Thermafiber, Inc., an Owens Corning company: www.owenscorning.com
 - a. Alternate products shall be allowed provided they meet the minimum requirements prescribed in this section.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.4 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. Owner-provided field quality control.

1.2 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- C. ASTM C834 - Standard Specification for Latex Sealants.
- D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- I. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- J. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- K. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- L. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- M. SCAQMD 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

- A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.

4. Substrates the product should not be used on.
 5. Substrates for which use of primer is required.
 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, VOC content, and recommended tools.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
1. MR Credit 4: BPDO - Material Ingredients
 - a. For sealants provide Material Ingredient Report.
 2. 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 v1.2-2017 and VOC content in g/L. Include volume of material applied per product.
- D. Color Cards for Preliminary Selection: Where sealant color is not specified, submit manufacturer's color cards showing full range of colors available for selection. Architect may select up to three colors for final selection at each condition.
- E. Field Samples for Verification: Provide a maximum of three color samples for each condition requiring color selection (up to 6 locations selected by Architect), including custom colors, installed in-situ, 12 inches in length, to be reviewed by Architect for final color selection.
- F. Preconstruction Laboratory Test Reports: Submit with Product Data.
- G. Joint Sealant Schedule: Include the following information:
1. Joint sealant substrate application, joint location, and designation.
 2. Joint sealant manufacturer and product name.
 3. Joint sealant primer and backer.
 4. Joint sealant color.
 5. Any special conditions.
- H. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- I. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- J. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.
- C. Preconstruction Laboratory Testing:
1. Adhesion Testing: In accordance with ASTM C794.
 2. Compatibility Testing: In accordance with ASTM C1087.
 3. Stain Testing: In accordance with ASTM C1248; required only for porous substrates.

4. Provide data showing previous testing on each combination of sealant, substrate, backing and accessories used on this Project, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
 - a. If a substrate used on the Project has not been tested within the last 24 months, arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories. Allow sufficient time for testing to avoid delaying the work, and deliver sufficient samples to manufacturer for testing. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- D. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
- E. Field Quality Control Plan:
 1. Visual inspection of entire length of sealant joints.
 2. Destructive field adhesion testing of sealant joints, except interior sealant joints.
 - a. For each different sealant and substrate combination, allow for one test every 1000 linear feet (305 meters).
 - b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
 3. Field Quality Control Log Form: Show same data fields as on Joint Sealant Schedule, adding date of installation of field sample to be tested and date of test, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- F. Field Adhesion Test Procedures:
 1. Allow sealants to fully cure as recommended by manufacturer before testing.
 2. Have a copy of the test method document available during tests.
 3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
 4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
 1. Sample: At least 18 inch long.
 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
 3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
 4. Record results on Field Quality Control Log.
 5. Repair failed portions of joints.

1.5 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
 - 1. Provide 20-year warranty for silicones; minimum 10-year warranty for urethanes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 2. Pecora Corporation: www.pecora.com.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com.
 - 4. Sika Corporation: www.usa-sika.com.
 - 5. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 2. Pecora Corporation: www.pecora.com.
 - 3. Sika Corporation: www.usa-sika.com.
 - 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Such gaps and openings in gypsum board and plaster finished stud walls and suspended ceilings.
 - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Other joints indicated below.
 - 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.

- b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
 - 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 - 2. Control and Expansion Joints in Concrete Paving: Self-leveling or Nonsag polyurethane "traffic-grade" sealant.
 - 3. Concealed, non-dynamic "bedding" joints, such as door thresholds: Butyl rubber, non-curing
 - 4. Control, expansion, and soft joints in masonry:
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
 - 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. Floor Joints in Wet Areas: Nonsag or Self-leveling polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
 - 3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; .
 - 4. In Sound-Rated Assemblies: Acrylic emulsion latex or water-based elastomeric sealant.
 - 5. Narrow Control Joints in Interior Exposed Concrete Slabs: Self-leveling epoxy sealant.
 - 6. Tile control and expansion joints in Wet Areas: Mildew-resistant silicone sealant
- D. Interior Wet Areas include: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
- E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.3 JOINT SEALANTS - GENERAL

- A. Sustainable Design Requirements
 - 1. Provide Material Ingredient Report.
 - 2. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 and VOC content in g/L. Include volume of material applied per product.

2.4 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Non-Staining To Porous Materials: Non-staining to porous materials when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Custom Color: To be selected by Architect from manufacturer's full custom range.
 - 5. Cure Type: Single-component, neutral moisture curing.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Custom Color: To be selected by Architect.

- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Custom Color: To be selected by Architect from manufacturer's full custom range.
- D. Nonsag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's full range.
- F. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.5 SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
 - 1. Composition: Single or multicomponent, 100 percent solids by weight.
 - 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 - 3. Custom Color: To be selected by Architect .
 - 4. Joint Width, Minimum: 1/8 inch.

2.6 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 - 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.

2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
 - C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
 - D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
 - E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

- A. Owner will employ an independent testing agency to perform field quality control inspection and testing.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- C. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 07 9513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Expansion joint cover assemblies for floor, wall, and ceiling surfaces.

1.2 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

1.3 SUBMITTALS

- A. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- B. Shop Drawings: Indicate joint and splice locations, miters, layout and extent of the work, affected adjacent construction and anchorage locations.
- C. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. Interior Floor-to-Floor Joints Subject to Thermal Movement:
 - 1. Products:
 - a. Architectural Art Mfg.; B-series: www.archart.com/#sle..
 - b. Construction Specialties, Inc.; DGTP: www.c-sgroup.com/#sle..
 - c. MM Systems Corp; LASB-NB: www.mmsystemscorp.com/#sle..
 - d. Finish: Mill finish.
- B. Interior Non-Fire-Rated Wall-to-Wall/Ceiling-to-Ceiling Joints Subject to Thermal Movement:
 - 1. Products:
 - a. Architectural Art Mfg.; G-series: www.archart.com.
 - b. Construction Specialties, Inc.; ASM: www.c-sgroup.com.
 - c. MM Systems Corp; EX-K: www.mmsystemscorp.com
 - d. Finish: Mill finish.
- C. Interior Non-Fire-Rated Wall-to-Ceiling Joints Subject to Thermal Movement:
 - 1. Products:
 - a. Architectural Art Mfg.; G-series: www.archart.com.
 - b. Construction Specialties, Inc.; ASM: www.c-sgroup.com.
 - c. MM Systems Corp; EX-L: www.mmsystemscorp.com
 - d. Finish: Mill Finish.

- D. Exterior Wall-to-Wall Joints Subject to Thermal Movement:
 - 1. Products:
 - a. Architectural Art Mfg.: R-series: www.archart.com.
 - b. Construction Specialties, Inc.; HS: www.c-sgroup.com.
 - c. MM Systems Corp; ESS: www.mmsystemscorp.com.
 - d. Finish: As selected by Architect from manufacturer's full range and custom color options.
- E. Exterior Roof-to-Roof Joints Subject to Movement:
 - 1. Per SMACNA.

2.2 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
 - 4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Floor Joint Covers: Coordinate with indicated floor coverings.
 - 1. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.
- C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.
- D. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

2.3 MATERIALS

- A. Resilient Seals:
 - 1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
 - 2. For Pedestrian Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
 - 3. For Vehicular Traffic Applications: EPDM rubber, Neoprene, or Santoprene; no PVC; Shore A hardness of 40 to 50 Durometer.
 - 4. Color: Gray.
- B. Anchors and Fasteners: As recommended by cover manufacturer.
- C. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.
- D. Threaded Fasteners: Aluminum.
- E. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.3 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Fire-rated hollow metal doors and frames.
- C. Thermally insulated hollow metal doors with frames.
- D. Sound-rated hollow metal doors and frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.2 ABBREVIATIONS AND ACRONYMS

- A. ANSI - American National Standards Institute.
- B. HMMA - Hollow Metal Manufacturers Association.
- C. NAAMM - National Association of Architectural Metal Manufacturers.
- D. NFPA - National Fire Protection Association.
- E. SDI - Steel Door Institute.
- F. UL - Underwriters Laboratories.

1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- J. ASTM E413 - Classification for Rating Sound Insulation.
- K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- U. UL (DIR) - Online Certifications Directory.
- V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- W. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, fire-resistance ratings, and finishes.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel doors provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content steel or aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

- D. Schedule: Provide a schedule of hollow metal work, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- E. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; [____]: www.assaabloydss.com.
 - 2. Curries, an Assa Abloy Group company; [____]: www.assaabloydss.com.
 - 3. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.

2.2 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush, smooth faces. Refer to Door Schedule for additional information.
 - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
 - 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
- D. Sustainable Design Requirements
 - 1. Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

2.3 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 - 2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thermal Resistance: R-Value of ____.
 - 4. Door Thickness: 1-3/4 inch, nominal.
 - 5. Top Closures: Flush with top of faces and edges.
 - 6. Weatherstripping: Refer to Section 08 7100.
 - 7. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 - 3. Door Thickness: 1-3/4 inch, nominal.
 - 4. Door Face Sheets: Flush, smooth faces.
 - 5. Door Finish: Factory finished.
- C. Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.

2. Fire Rating: As indicated on drawings, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
 4. Provide units listed and labeled by UL (DIR).
 - a. Attach fire rating label to each fire rated unit.
 5. Smoke and Draft Control Doors: Doors withing the "SP" Smoke Partition line indicated on the CS Drawings to be same construction as fire-rated doors. Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - b. Gasketing: Coordinate with door hardware schedule. Provide additional gasketing or edge sealing as necessary to achieve leakage limit.
 - c. Label: Include the "S" label on fire-rating label of door.
 6. Core Material: Mineral board.
 7. Door Thickness: 1-3/4 inch, nominal.
 8. Door Face Sheets: Flush, smooth faces..
 9. Door Finish: Factory primed and field finished.
- D. Sound-Rated Interior Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 35, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
 3. Door Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
 4. Door Thickness: As required to meet acoustic requirements indicated.
 5. Door Face Sheets: Flush, smooth finish.
 6. Door Finish: Factory finished.
 7. Sound Seals: Integral, in door and/or frame.
 8. Opening Force of Sound-Rated Doors, Non-Fire Rated: 5 lbs, maximum, in compliance with ADA Standards.

2.4 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
 4. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 2. Frame Finish: Factory primed and field finished.

- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
 - 1. Fire Rating: Same as door, labeled.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Frame Finish: Factory primed and field finished.
- E. Sound-Rated Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 2. Frame Finish: Factory primed and field finished.
- F. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- I. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- J. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

2.5 ACCESSORIES

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
 - 1. Style: Sightproof inverted V blade.
 - 2. Louver Free Area: ____ percent.
 - 3. Fasteners: Exposed or concealed fasteners.
- B. Glazing: As specified in Section 08 8000.
- C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- D. Astragals for Double Doors: ____
 - 1. Exterior and Non-Rated Doors: Steel, Z-shaped. Flat or T-Shaped.
 - 2. Fire-Rated Doors: Steel, shape as required for fire rating.
- E. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.6 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

1. Color: As selected by Architect from manufacturer's standard range.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- F. Coordinate installation of hardware.
- G. Coordinate installation of glazing.
- H. Coordinate installation of electrical connections to electrical hardware items.
- I. Touch up damaged factory finishes.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.

- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.6 SCHEDULE - **SEE DRAWINGS**

END OF SECTION

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, acoustical, and special function.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI A135.4 - American National Standard for Basic Hardboard.
- C. ANSI A208.1 - American National Standard for Particleboard.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- G. ASTM E413 - Classification for Rating Sound Insulation.
- H. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- I. AWI (QCP) - Quality Certification Program.
- J. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- K. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- L. NEMA LD 3 - High-Pressure Decorative Laminates.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- N. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- O. UL (DIR) - Online Certifications Directory.
- P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- Q. UL 752 - Standard for Bullet-Resisting Equipment.
- R. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
- S. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.3 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For wood doors provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For wood doors 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 provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials. For composite wood doors: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.
- C. Samples: Submit two samples of door veneer, __6__ by __6__ inch in size illustrating wood grain, stain color, and sheen.
- D. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Specimen warranty.
- G. Warranty, executed in Owner's name.

1.4 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.6 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Eggers Industries: www.eggersindustries.com/#sle.
 - 2. Graham Wood Doors: www.grahamdoors.com/#sle.
 - 3. Marshfield DoorSystems, Inc: www.marshfelddoors.com/#sle.

2.2 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Smoke and Draft Control Doors: In addition to required fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A requirements for "S" label; no additional gasketing or edge sealing allowed.
 - 4. Sound-Rated Doors: Minimum STC of 30 (Common); 40 (Music Classrooms), calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
 - 5. Wood veneer facing with factory transparent finish as indicated on drawings.
- C. Sustainable Design Requirements
 - 1. Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. Documentation indicating percentage new wood, percentage FSC and Chain-of-Custody (CoC) certificates indicating compliance with forest certification requirements. Include vendor invoice indicating FSC CoC.
 - 4. Provide Material Ingredient Report.
 - 5. Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.

2.3 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Clear Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Any option allowed by quality standard for grade.
 - 2. "Running Match" each pair of doors and doors in close proximity to each other.

2.5 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

2.6 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-2, Catalyzed Lacquer.
 - b. Sheen: Flat.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

2.7 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1113.
- B. Glazing: As specified in Section 08 8000.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- D. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
 - 2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

3.3 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling access door and frame units.

1.2 REFERENCE STANDARDS

- A. UL (FRD) - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Material: Steel.
 - 3. Size: 12 inch by 12 inch.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Location: As indicated on drawings.
 - 2. Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 3. Size: 12 inch by 12 inch.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- C. Fire-Rated Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Wall Fire-Rating: As indicated on drawings.
 - 3. Material: Steel.

4. Size: 12 inch by 12 inch.
5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:

1. Location: As indicated on drawings.
2. Material: Steel.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Other Ceilings: 12 inch by 12 inch.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2 WALL AND CEILING MOUNTED UNITS

A. Manufacturers:

1. Activar Construction Products Group - JL Industries; _____: www.activarcpg.com/#sle.
2. Babcock-Davis; _____: www.babcockdavis.com/#sle.
3. Nystrom, Inc; _____: www.nystrom.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3323 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead coiling doors, operating hardware, fire-rated, non-fire-rated, and exterior; manually or electrically operated.
- B. Wiring from electric circuit disconnect to operator to control station.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ITS (DIR) - Directory of Listed Products.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- H. NEMA MG 1 - Motors and Generators.
- I. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- J. UL (DIR) - Online Certifications Directory.
- K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.3 SUBMITTALS

- A. Product Data: Provide general construction, electrical equipment, and component connections and details.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements.
 - 1. MR Credit 3: BPDO - Sourcing of Raw Materials.
 - a. For recycled content steel or aluminum: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 3 X 12 inch in size illustrating shape, color and finish texture.

- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures, and _____.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. C.H.I. Overhead Doors; Model 6180: www.chiohd.com/#sle.
 - 2. Clopay Building Products; Model CERD20: www.clopaydoor.com/#sle.
 - 3. McKeon Door Company; ClimateGuard, IS3000 Series: www.mckeondoor.com.
- B. Overhead Coiling Fire Doors:
 - 1. C.H.I. Overhead Fire Doors; Model 7301: www.chiohd.com/#sle.
 - 2. Clopay Building Products; Model CERD20: www.clopaydoor.com/#sle.
 - 3. McKeon Door Company; AutoSet Model FSFD: www.mckeondoor.com.

2.2 COILING DOORS

- A. Fire Rated Exterior Coiling Doors: Steel slat curtain.
 - 1. 2 hour fire rating.
 - 2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
 - 3. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
 - 4. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1.
 - 5. Nominal Slat Size: 3 inches wide x required length.
 - 6. Finish: Galvanized.
 - 7. Finish: Factory primed; field painted.
 - 8. Guide, Angles: Galvanized steel; prime paint.
 - 9. Hood Enclosure: Manufacturer's standard; primed steel.
 - 10. Electric operation.
- B. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.

1. Single thickness slats.
 2. Nominal Slat Size: 2 inches wide x required length.
 3. Finish: Galvanized.
 4. Finish: Factory primed; field painted.
 5. Guides, Angles: Galvanized steel; Prime paint
 6. Hood Enclosure: Manufacturer's standard; galvanized steel; prime paint.
 7. Manual hand chain lift operation.
 8. Mounting: Within framed opening.
 9. Locking Devices: Slide bolt on inside.
- C. Fire-Rated Coiling Doors: Steel slat curtain; conform to NFPA 80.
1. 2 hour fire rating.
 2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
 3. Oversized Openings: Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated units and operating hardware assembly.
 4. Single thickness slats.
 5. Finish: Primed.
 6. Finish: Factory painted, color as selected.
 7. Guides, Angles: Stainless steel.
 8. Hood Enclosure: Manufacturer's standard; primed steel.
 9. Coiling Door Release Mechanism: Fire alarm system activated with automatically governed closing speed.
 10. Electric operation.

2.3 MATERIALS AND COMPONENTS

- A. Curtain Construction: Interlocking slats.
1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
 3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum thickness, 22 gage, 2 inch; ASTM A653/A653M galvanized steel sheet.
1. Galvanizing: Minimum G90 coating.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.
 2. Stainless Steel: ASTM A 666, Type 304, rollable temper.
- E. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
- F. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.
 2. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
 3. Manual Chain Lift: Provide padlockable chain keeper on guide.

- G. 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.
- H. Sustainable Design Requirements:
 - 1. Provide documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

2.4 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
 - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Motor Enclosure:
 - a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
 - b. Interior Coiling Doors: NEMA MG 1, Type 1; open drip proof.
 - 3. Motor Rating: 1/3 hp; continuous duty.
 - 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 - 6. Controller Enclosure: NEMA 250, Type 1.
 - 7. Opening Speed: 12 inches per second.
 - 8. Brake: Adjustable friction clutch type, activated by motor controller.
 - 9. Manual override in case of power failure.
 - 10. Refer to Section 26 0583 for electrical connections.
- C. Control Station: Provide standard key-operated (Open-Close-Stop) momentary-contact control device for each operator conforming to UL 325.
 - 1. Key-operation must accept Best keys.
 - 2. 24 volt circuit.
 - 3. Surface mounted, at interior door jamb.
 - 4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms conforming to UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install fire-rated doors in accordance with NFPA 80.

- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- F. Coordinate installation of electrical service with Section 26 0583.
- G. Complete wiring from disconnect to unit components.
- H. Complete wiring from fire alarm system.
- I. Install enclosure and perimeter trim.

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 4013 - PROTECTIVE FRAMED GLAZING ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior protective framed glazing assembly.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- H. 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.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. ITS (DIR) - Directory of Listed Products.
- K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- L. UL (DIR) - Online Certifications Directory.
- M. UL 263 - Standard for Fire Tests of Building Construction and Materials.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by each affected installer.

1.4 SUBMITTALS

- A. Product Data: Provide evidence of compliance with fire performance criteria and manufacturer's published product data on framing components, glazing, anchorage and fasteners, and doors, if any.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations.
 - a. For glazing provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 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.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For glazing provide Material Ingredient Report.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit samples as follows illustrating each exposed metal finish of interior and exterior project-specific applications.
 - 1. For factory-finished steel members, submit minimum of three color selection samples.
- E. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.
- F. Installer's Qualification Statement.
- G. Designer's Qualification Statement.
- H. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6 MOCK-UP

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide mock-up that includes components of the types specified, and assemble to illustrate complete assembly, including attachments, anchors, and perimeter sealant.
- C. Locate on-site where directed. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F, and maintain above this minimum temperature during and for 48 hours after installation.

1.9 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide ten year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide ten year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 EXTERIOR PROTECTIVE FRAMED GLAZING ASSEMBLIES

- A. Manufacturers - Single Story Walls:
 - 1. SAFTIFIRST, a division of O'Keeffe's, Inc; GPX Architectural Series with fire resistive walls/windows: www.safti.com/#sle.
 - 2. Technical Glass Products; Fireframes Curtainwall Series: www.fireglass.com/#sle.
 - 3. Vetrotech North America; VDS 60: www.vetrotechusa.com/#sle.
- B. Provide factory fabricated, factory finished framing members with glazing and related flashings, anchorage and attachment devices.
 - 1. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" within internal spaces.
 - 2. 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.
- C. Fire Performance: Provide hourly fire-resistance-rating as indicated; tested as an assembly including glazing in compliance with ASTM E119 or UL 263 and requirements of local authorities having jurisdiction.
 - 1. Acceptable evidence of compliance includes listing by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction.
- D. Structural Performance: Design and size components to withstand the following loading without damage or permanent set.
 - 1. Design Live Loads: Comply with requirements of applicable code.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.

3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths or 3/4 inch, whichever is less, under specified design load.
4. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- E. Water Penetration: No uncontrolled water on indoor face when tested as follows:
 1. Test Pressure Differential: 10 pound-force per square foot.
- F. Air Leakage: Maximum of 0.06 cu ft/min/sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 pounds per square foot pressure differential across assembly.
- G. Thermal Performance:
 1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
 2. Overall U-value Including Glazing: 0.35 Btu/(hr sq ft deg F), maximum.
- H. Acoustical Performance: Substantiate acoustical performance using test sample identical to system being specified, including glazing.
 1. Sound Attenuation: OITC of 35, minimum, from exterior to interior.
- I. Sustainable Design Requirements:
 1. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

2.2 COMPONENTS

- A. Framing Members: Formed steel structural members with aluminum cladding and non-combustible thermally-resistive material as required for fire rating.
 1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
 1. Arrange fasteners and attachments to conceal from view.
- C. Firestopping: As specified in Section 07 8400.
- D. Sealants Within Fire-Rated Assembly: As required by fire-rating and manufacturer's assembly.
- E. Refer to Section 07 9200 for additional information on sealant requirements.
- F. Glazing Gaskets: Type to suit application to achieve fire-rating, weather, moisture, and air infiltration requirements.

2.4 FINISHES

- A. Finishing: Apply factory finish to surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural metal surfaces are visible in completed assemblies, including joint edges.
- B. Aluminum Finish: Superior performing organic coatings.
 - 1. Apply factory finish to surfaces that will be exposed in completed assemblies.
 - 2. Touch-up surfaces cut during fabrication so that no natural aluminum metal surfaces are visible in completed assemblies, including joint edges.
 - 3. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- C. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
- D. Color: To be selected by Architect from manufacturer's full range.
- E. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

- A. Install wall system in accordance with limitations of fire rating and with manufacturer's instructions.
- B. Install framed glazing assemblies in accordance with NFPA 80 and requirements of local authorities having jurisdiction.
- C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- D. Provide alignment attachments and shims to permanently fasten system to building structure.
- E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- F. Provide thermal isolation where components penetrate or disrupt building insulation.
- G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch every 3 feet non-cumulative or 1/2 inch per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Replace components that have failed field testing and retest until performance is satisfactory.

3.5 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- L. 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.
- M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

- O. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- P. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

1.3 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
- B. LEED Submittal Requirements: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For storefront provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 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.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For storefront provide Material Ingredient Report.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- F. Installer's Qualification Statement.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.5 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.

1.6 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.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum-Framed Storefront and Doors:
 - 1. EFCO Corporation; _____: www.efcocorp.com/#sle.
 - 2. Kawneer North America; _____: www.kawneer.com/#sle.
 - 3. YKK AP America Inc; _____: www.ykkap.com/#sle.

2.2 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Position: Centered (front to back).
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
 - 3. Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 4. 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.
 - 5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 7. 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.
 - 8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 - 9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 10. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements:

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of applicable code.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

C. Sustainable Design Requirements:

1. Provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
2. Provide Material Ingredient Reports.
3. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

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. Glazing Stops: Flush.
2. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.
2. Finish: Same as storefront.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.5 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) system.

1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected from Manufacturer's full range..

- a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - 3) Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.

B. Color: As selected by Architect from manufacturer's full range.

2.6 HARDWARE

- A. Door Hardware: As specified in Section 08 7100.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
 - 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
- C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

3.5 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.6 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- K. ASTM C1401 - Standard Guide for Structural Sealant Glazing
- L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- 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.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- O. ASTM E413 - Classification for Rating Sound Insulation.
- P. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

- Q. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- R. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.

1.4 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For curtain wall provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 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.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For curtain wall windows provide Material Ingredient Report.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required. Submit signed and sealed shop drawings.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- E. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure. Submit signed and sealed calculations.
- F. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.
- G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

- B. Full-Size Mock-up Testing: Have a specimen representative of project conditions tested by an independent testing agency for compliance with specified thermal, structural, air infiltration, water penetration, and sound attenuation criteria.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.8 WARRANTY

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Glazed Aluminum Curtain Walls:
 - 1. EFCO, a Pella Company: www.efcocorp.com/#sle.
 - 2. Kawneer North America: www.kawneer.com/#sle.
 - 3. YKK AP America Inc: www.ykkap.com/#sle.

2.2 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Outside glazed, with pressure plate and mullion cover.
 - 2. Fabrication Method: Either shop/factory or field fabricated system.
 - 3. Glazing Method: Field glazed system.

4. Finish: Superior performing organic coatings.
 - a. Factory finish surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 5. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 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. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
 9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set. Any steel reinforcing required inside the mullions based on the design, shall be included.
1. Design Wind Loads: Comply with the applicable code.
 - a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
 - b. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
 2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection tested by independent agency in accordance with ASTM E1996 for Wind Zone 4 - Enhanced Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
 3. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 15 psf.
- D. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
- E. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
- F. Acoustical Performance Requirements:
1. Sound Attenuation: Outdoor-Indoor Transmission Class (OITC) of 35, minimum, from exterior to interior, per ANSI S12-60.

- G. Sustainable Design Requirements:
 - 1. Provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Recycled Content: Provide aluminum and steel components with recycled content.
 - 3. Provide Material Ingredient Report.

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
- B. Glazing: As specified in Section 08 8000.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- D. Glazing Accessories: As specified in Section 08 8000.

2.5 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
 - 1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer's full range..
 - a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - 3) Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
- B. Color: To be selected by Architect from manufacturer's full range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.

- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- C. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
- D. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

- E. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- F. Test Area: Perform tests on one bay at least 30 feet (9.1 m), by one story.
- G. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 - 1. Test a minimum of two areas on each building facade.
 - 2. Repair installation areas damaged by testing.
- H. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- I. Prepare test and inspection reports.

3.5 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5113 - ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash.

1.2 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- 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.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- O. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

- P. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- Q. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- R. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- S. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

1.3 SUBMITTALS

- A. Product Data: Provide component dimensions and internal drainage details.
- B. LEED Submittals: Comply with Seciton 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For windows provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 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
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For windows provide Material Ingredient Report.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Samples: Submit two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.
- E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- H. Installer's Qualification Statement.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.6 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum Windows:
 - 1. EFCO, a Pella Company: www.efcocorp.com/#sle.
 - 2. YKK AP America Inc: www.ykkap.com/#sle.
 - 3. Kawneer North America; www.kawneer.com.

2.2 WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
 - 1. Frame Depth: 4 inches.
 - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 - 3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 5. 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.
 - 6. Thermal Movement: Design to accommodate thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads

on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Exterior Finish: Superior performing organic coatings.
 - 3. Interior Finish: Superior performing organic coatings.
- C. Sustainable Design Requirements
 - 1. Provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Recycled Content: Provide Aluminum and steel components with recycled content.
 - 3. Provide Material Ingredient Reports.

2.3 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - 1. Performance Class (PC): R.
- B. Design Pressure (DP): In accordance with applicable codes.
- C. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- D. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
- E. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.
- F. Air Leakage: Maximum of 0.1 cu ft/min sq ft per unit area of outside frame dimension, with 6.27 psf differential pressure when tested in accordance with ASTM E283.
- G. Condensation Resistance Factor of Frame: 50, measured in accordance with AAMA 1503.
- H. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
- I. Forced Entry Resistance: Tested to comply with ASTM F588 requirements for performance level of Grade 10 for specific window style required.
- J. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 35, when tested in accordance with ASTM E90 and ASTM E1332.

2.4 COMPONENTS

- A. Frames: +/- 2 inch wide by 4 inch deep profile, of approximately 1/8 inch thick section (or manufacturer's standard thickness); thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Glazing: As specified in Section 08 8000.
- C. Sills: Approximately 1/8 inch thick (or manufacturer's standard thickness), extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill end.

- D. Fasteners: Stainless steel.
- E. Glazing Materials: As specified in Section 08 8000.
- F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
 - 1. Refer to Section 07 9200 for additional requirements.

2.5 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5005 alloy, H12 or H14 temper.

2.6 FINISHES

- A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
 - 1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer's full range..
 - a. Manufacturers:
 - 1) PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - 2) Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - 3) Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
- B. Finish Color: As selected by Architect from manufacturer's full range.
- C. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.
- D. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.2 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.

- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Install glass and infill panels in accordance with requirements specified in Section 08 8000.

3.3 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
 - 1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
 - 2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
- C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance conforms to specified requirements.

3.5 CLEANING

- A. Remove protective material from factory finished aluminum surfaces.

END OF SECTION

SECTION 08 6223 - TUBULAR SKYLIGHTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tubular skylights, consisting of skylight dome, reflective tube, and diffuser assembly.

1.2 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- E. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- F. 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.
- G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- H. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.
- C. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- D. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Skylights: Manufacturer's standard warranty for 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. DayLite, Natural Lighting Technologies; _____: www.dayliteco.com/#sle.
- B. Solatube International, Inc; SkyVault M74: www.solatube.com/#sle.
- C. Velux America, Inc; VELUX TCC - Curb Mounted SUN TUNNEL Skylight: www.veluxusa.com/#sle.

2.2 TUBULAR SKYLIGHTS

- A. Tubular Skylights: Transparent roof-mounted skylight dome and curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces.
 - 1. Fabrication and assembly of components is by single manufacturer.
 - 2. Non-Metal Parts: Flammability less than the following.
 - a. Roof-Top Components: Class B when tested in accordance with ASTM E108 or UL 790.
 - b. Combustibility - Light Transmitting Parts: Minimum 2.5 inches/min (ICC Class CC-2), when tested in accordance with ASTM D635.
- B. Roof Assemblies: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
 - 1. Glazing: Acrylic plastic, 1/8 inch minimum thickness.
 - 2. Dome Ring: Attached to top of base section; 0.090 inch nominal thickness injection molded high impact ABS; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing; weather seal of medium density pile weather stripping.

- C. Reflective Tube: ASTM B209 (ASTM B209M) aluminum sheet, thickness between 0.015 inch and 0.020 inch.
- D. Diffuser Assemblies: Supporting light transmitting surface at bottom termination of tube, with compression seal to minimize condensation and bug or dirt infiltration.
 - 1. Ceiling Ring: Edge trim for ceiling opening; injection molded high impact ABS.
 - 2. Diffuser Trim: Edge and attachment trim for diffuser lens; injection molded high impact ABS.
 - 3. Lens: Flush frosted lens.
 - 4. Lens Material: Acrylic plastic.
 - 5. Visible Light Transmission (VLT): 90 percent, minimum.
 - 6. Seal: Closed cell EPDM foam rubber.

2.3 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific tubular skylight:
 - 1. Product Type: Tubular Daylighting Device, Closed Ceiling (TDDCC).
- B. Design Pressure (DP): In accordance with applicable codes.
- C. No permanent deflection in excess of 0.2 percent of span.
- D. Air Infiltration: Maximum 0.10 cu ft/min sq ft per unit area of outside frame dimension at 6.27 psf pressure differential when tested in accordance with ASTM E283.
- E. Water Resistance: No uncontrolled water leakage at 6.27 psf pressure differential with water rate of 5 gallons/h/sf, when tested in accordance with ASTM E331; design to ensure that water will not accumulate inside assembly.

2.4 ACCESSORIES

- A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.
- B. Sealant: Elastomeric, silicone or polyurethane; compatible with materials being sealed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Set roof assembly flashing in continuous bead of sealant.
- C. Seal joints exposed to weather in accordance with sealant manufacturer's written instructions.
- D. Conduct field test for water tightness; conduct water test in presence of Architect. Correct defective work and re-test until satisfactory.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 08 7100 - FINISH HARDWARE

PART 1 GENERAL

1.1 DESCRIPTION:

- A. Provide all work necessary to complete all finish hardware work as shown on the drawings or inferable therefrom and/or specified herein, in accordance with the requirements of the Contract Documents.

1.2 DETAILS OF WORK:

- A. Refer to drawings, details and schedules for items requiring finish hardware. It is the intent of this section to include all finish hardware required for the project, except for items, which are specifically noted as being specified in other sections of the specifications.
- B. Coordinate the application of hardware items with door and frame details and with methods of fastening as hereinafter specified.
- C. Provide complete templates, schedules and fastening details to door and frame manufacturers and other trades requiring same, to insure doors and frames are properly cut, reinforced and prepared to receive hardware.
- D. Single source, provide only the products of one manufacturer where several manufacturers are specified for one type of hardware.
- E. Work includes, but not limited to the following items:
 - Hinges
 - Lock and latch sets
 - Deadlocks
 - Exit devices and removable mullions
 - Door closers
 - Electro-magnetic door release
 - Electro-magnetic locks
 - Power supply
 - Key switch
 - Overhead stops and holders
 - Push and pull plates
 - Kick and armor plates
 - Flush bolts
 - Floor and/or wall stops
 - Thresholds
 - Astragals
 - Weather-stripping
 - Gasketing
 - Door silencers
 - Key cabinet
- F. Work specified to be provided under other sections, includes rough carpentry and items of finish hardware so specified or provided as part of other sections, including the following;
 - Hardware For:
 - Windows
 - Toilet partitions

Operable partitions
Lockers
Cabinets or casework
Roof scuttles
Fence or gates

1.3 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Provide finish hardware in accordance with the requirements, under the published procedures of the following recognized agencies. Wherever possible all hardware and its application are intended to comply with the latest edition of CABO/ANSI A117.1, NFPA 80, NFPA 101 and NFPA 105. It is the intent of this specification that all hardware and its application shall comply or exceed the standards for labeled openings. In case of conflict between type of hardware specified and type required for fire protection, provide type required by NFPA and UL.

1.4 QUALITY ASSURANCE:

- A. All work performed and all materials provided shall be in conformity with the contract requirements.
- B. All products listed herein are intended to describe quality, type and function of items listed. Accuracy, and strict compliance with the samples and descriptive literature upon which acceptance is based, shall be the sole responsibility of this supplier.
- C. If the Architect finds materials or the finished product in which the materials are used are not in complete conformity with the contract requirements and has resulted in an inferior or unsatisfactory product, the materials shall be removed and replaced by and at the expense of the supplier.
- D. The supplier shall be responsible for the provisions, proper coordination and function of the finish hardware required for all openings.

1.5 SUPPLIER QUALIFICATIONS:

- A. The hardware supplier shall, in the opinion of the Architect, have sufficient experience and shall have an Architectural Hardware Consultant (AHC) as certified by the Door and Hardware Institute, as a full time employee of its organization. The Architectural Hardware Consultant shall be available to attend job meetings as required.
- B. After delivery of hardware and prior to its installation, the hardware consultant shall meet with the Architect and Contractor to compare final samples with actual hardware delivered. To assure acceptability, they shall review catalogs, brochures, templates, installation instructions, final hardware schedule, and shall rehearse installation, procedures and workmanship, with special emphasis on unusual conditions to ensure correct technique of installation, and coordination with other work.
- C. The hardware supplier shall maintain a warehouse and office within a fifty (50) mile radius of the job and maintain an inventory and field service staff in order to service the project properly.

1.6 SUBMITTALS:

- A. Submit, for review, six (6) complete copies of the finish hardware schedule covering complete identification of all items required for the project. Include manufacturer's names and identification of finishes. Include six (6) complete copies of catalog cuts and/or technical data sheets, identifying each item of hardware and any other data as may be required to show

compliance with these specifications. The data on the shop drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Architect to review the information as required. These schedules shall be prepared in conformity with the best practice and standards of the Door and Hardware Institute.

- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO – Environmental Product Declarations
 - a. For hardware provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO – Sourcing of Raw Materials
 - a. For recycled content hardware: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO – Material Ingredients
 - a. For hardware provide Material Ingredient Report.
- C. Include a separate keying schedule, which shall include Architect's door numbers, hardware headings, room description numbers and Owner's revised room description numbers as part of the final submittal of the hardware schedule. Schedule format to include an additional column to allow for Owner's revised room description numbers. Upon final approval of the keying requirements by the Architect and Owner, the Owners room numbers shall be listed in the appropriate column and resubmitted to Frederick County Public Schools for final review and approval.
- D. The Architect's review of schedules shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations or omissions from the specified requirements to provide complete hardware for the project.
- E. After approval of the hardware schedule the hardware supplier shall furnish to FCPS, four (4) complete sets of manufacturers warranties and product data.

All information will be submitted bound in a hardware schedule cover and shall contain the following information in the order as listed:

- Hardware schedule cover sheet
- Index of manufacturer's
- Manufacturers catalog cuts in the order as listed in the index
- Catalog cuts to be color coded and identified
- Warranties to be listed in order of index the supplier shall also make available to the owner any service manuals for locksets.

1.7 SAMPLES:

- A. In conjunction, and concurrent therewith, with the submission of the finish hardware schedule, submit to the Architect, samples of each typical item of exposed hardware in specified finish. Submission of samples prior to installation is mandatory. Architect's review of samples will be for design, pattern, finish and color only. All other requirements are the exclusive responsibility of the Contractor.
- B. Samples Required
 - 1. Hinges, each type.
 - 2. Lockset with lever, SFIC cylinder.
 - 3. Panic device, rim type with trim.
 - 4. Pulls complete with mounting accessories.
 - 5. Push plate with fasteners.
 - 6. Surface mounted closer.

7. Overhead holder/stop
8. Floor and/or wall bumpers
9. After final review, deliver samples to job site for comparison with hardware delivered for installation. Unblemished samples may be used as part of the Work.

1.8 PRODUCT HANDLING AND STORAGE:

- A. Package and label each item of hardware separately. Tag each item in accordance with the final hardware schedule. Each package shall contain appropriate fastenings, instructions and installation templates. Protect all items from loss or damage in shipment.
- B. The General Contractor shall be responsible for receiving and providing an adequate secured storage area for all hardware. Materials shall be stored so as to assure the preservation of its quality and acceptability for the work. Locate stored material to facilitate its prompt inspection by the Architect.

PART 2 PRODUCTS

2.1 GENERAL:

- A. Refer to hardware sets for application of individual hardware items as referenced to each opening or function.
- B. Sustainable Design Requirements:
 1. Provide Product-specific declaration or Industry-wide EPD or product- specific EPD. Include EPD Summary.
 2. For recycled content hardware: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 3. Provide Material Ingredient Report.

2.2 HARDWARE FINISHES:

- A. Produce finishes to exact match with Architect's selected samples. Variances in the color of each finish shall be minimized regardless of whether the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze. Comparative finishes shall appear the same when viewed two feet apart and three feet away. The two samples shall be under the same lighting conditions and on the same relative plane. The finish for each item of hardware shall match the finish selected for lock and latch sets. The type of finish for each hardware item is indicated in the hardware sets.

2.3 HARDWARE MOUNTING HEIGHTS:

- A. The following mounting heights shall apply throughout the work unless otherwise shown or specified and shall comply with the locations for hardware as recommended by the Door and Hardware Institute, other than as specified herewith.

1. Centerline of strike for levers	40-5/16"
2. Centerline of exit device touch pad	40"
3. Centerline of strike for dead locks	48"
4. Centerline of push plates	40"
5. Centerline of door pulls	40"

2.4 FASTENERS:

- A. Provide concealed fastenings wherever possible. The use of self-tapping or sheet metal screws is prohibited on all hardware except kick plates and push plates. All exit devices and door closers shall be through-bolt mounted.
1. Concealed Fasteners: Provide hardware items complete with appropriate type and length of screws or other fastenings suitable to ensure proper application.
 2. Exposed Fasteners: Provide hardware with countersunk Phillips oval head type screws where concealed fastening is not possible. The finish or color of these screws shall harmonize with the product as to finish and material.

2.5 MATERIALS AND MANUFACTURERS:

- A. Acceptable manufacturers for the various items specified are listed below. Products of the underlined manufacturers are ones used in this specification to denote the quality, type, design and function of hardware required. The items of hardware as specified by manufacturer's name and product nomenclature shall comply with any additional features and/or modifications such as base material, finishes, fasteners, etc. The manufacturer and supplier shall be responsible to comply with these requirements as a part of their acceptance. The special features as specified supersede the manufacturer's standard product. Only equivalent products of the listed manufacturers will be accepted. Items listed with NO SUBSTITUTE have been requested by Owner to match existing products, No alternate products will be considered for review, provide products as specified.

Hinges	Hager-Bommer-Ives
Continuous Hinges	Ives-Hager
Cylindrical Lock /Latch sets	Best-No Substitute
Mortise Locks w/Indicator	Schlage-No Substitute
Panic Devices	Von Duprin-No Substitute
Mullions	Von Duprin-No Substitute
Overhead Closers	LCN-No Substitute
Auto Operators	LCN-No Substitute
Overhead Holder	Glynn-Johnson-ABH
Electro-Magnetic Door Release	LCN - Rixson
Push Plates	Ives - Trimco - Burns
Kick and Armor Plates	Ives - Trimco - Burns
Flush Bolts	Ives - Trimco - Burns
Coordinators	Ives - Trimco - Burns
Stop and Bumpers	Ives - Trimco - Burns
Thresholds	Zero - National Guard - Reese
Weather-stripping	Zero - National Guard - Reese
Gasketing	Zero - National Guard - Reese
Astragals	Zero - National Guard - Reese
Door Silencers	Ives - Rockwood - Hager
Key Cabinet	Telkee
Access Control System	Best-No Substitute
Electric Strikes	Von Duprin-No Substitute

2.6 HINGES:

- A. All hinges shall be of the type and size as specified and shall conform to the latest edition of ANSI/BHMA A156.1 standards and in compliance with NFPA 80 Table 2.8A. Package all hinges with machine or wood screws as required by door and frame construction.
- B. Hinges shall be of flush ball bearing design with flat bottom tips and non-rising pins.

- C. All non-ferrous type hinges shall be provided with stainless steel pins as a standard and all exterior hinges shall be stainless steel with a non-removable pin (NRP) feature per hinge.
- D. Where the door jamb and/or trim projects to such an extent that the width of the hinge leaf specified will not allow the door to properly clear the frame or trim, the supplier shall provide hinges of sufficient width to clear.
- E. Types and Manufacturers:
- | | | |
|--------------|---------------|-------------|
| <u>Hager</u> | <u>Bommer</u> | <u>Ives</u> |
| BB1279 | BB5000 | 5BB1 |
| BB1168 | BB5004 | 5BB1HW |
| BB1191 | BB5006 | 5BB1 |
| BB1199 | BB5006 | 5BB1HW |
- F. Continuous hinges to be used at all aluminum storefront, cross-corridor, stairwell, cafeteria, gymnasium, locker room and exterior openings, and interior openings where doors are greater than 36" wide.
- G. Types and manufacturers:
- | | |
|-------------|--------------|
| <u>Ives</u> | <u>Hager</u> |
| 112XY | 780-112HD |
| 224XY | 780-224HD |

2.7 CYLINDRICAL LOCKS AND LATCHES:

- A. General: Lockset and latches shall be Best 9K extra-heavy-duty cylindrical series with 7-pin interchangeable core. Locks to have solid shank with no opening for access to keyed lever keeper. Lock chassis must be through-bolted outside of the lock chassis prep to prevent rotation of chassis after installation. Lock manufacturer shall provide three-year warranty, in writing, to the Owner, along with three copies of the lock service manual.
- B. Strikes shall be 16 gauge, curved brass, bronze, or stainless steel with a 1" deep box construction, and have sufficient length to clear trim and protect clothing.
- C. Tubular Deadbolts shall be Best 83T with 7-pin interchangeable core.
- D. **Note: Mortise-type locksets will not be acceptable except at staff corridor restroom applications. Provide Schlage L9485BD-06A-L283-722-L583-363 faculty restroom mortise locksets at restrooms designated by owner.**
- E. Types and Manufacturer's
- | | |
|-------------------------|--------------------------------|
| Cylindrical: | <u>Best</u> -No Substitution |
| Lock series and design: | 93K7 x 15 x 626 |
| Tubular Deadbolts: | 83T x 626 |
| Cores/Cylinders: | 7-pin to match existing system |
- Mortise: Schlage-No Substitution

2.8 PANIC DEVICES:

- A. General: Provide panic devices of the design, type, function and finish as specified here-within.
- All devices shall be a push through type touch pad design with return stroke fluid dampener and rubber bottoming dampers. Touch pads are to be stainless steel with no

- exposed rivets or screws and shall exceed height of mechanism case or rail assembly (T-Shaped) to eliminate pinch points. Plastic touchpads are not acceptable.
2. Latchbolts shall be self-lubricating and have a deadlocking feature.
 3. Exit devices shall be listed by UL for accident and hazard. Devices shall conform to ANSI A156.3, Grade 1 and conform to NFPA 80 and NFPA 101.
 4. All panic devices shall meet the performance tests found in the Underwriters Laboratories Standard UL305 and bear the UL listing mark for panic hardware or UL 305 and UL 10C for fire exit hardware as appropriate.
 5. All exit devices shall be through bolted. All trim shall be through bolted by means of concealed fasteners.
 6. A factory representative to insure proper adjustment and operation shall inspect all devices after installation. The representative shall submit a written report to the Architect with copies to the General Contractor and hardware supplier upon completion of his service. This report shall include any installation problems, noting door numbers and location along with recommendations to correct the problem.
 7. Provide non-fire labeled exit devices with CDSI-cylinder-dogging security indicator feature. Dogging mechanism shall be mechanical hook type with no plastic dogging cams. Provide LD-less dogging at exterior doors as designated by Owner.
 8. All surface strikes shall be roller type and come complete with a locking plate to prevent movement.
 9. End caps shall be of heavy-duty metal alloy construction and provide horizontal adjustment to provide flush alignment with device cover plate. When end cap is installed, no raised edges will protrude.
 10. Lever trim shall be heavy-duty type with a breakaway feature to limit damage to the unit from vandalism and fastened by means of concealed welded lugs and through-bolts from inside. Trim shall be forged brass with a minimum average thickness of .090" and have forged pulls. Provide at fire-labeled openings. Provide fail safe, electrified lever trim at stairwell doors required to lock for security purposes.
 11. Provide Ives VR910 Series pulls on all non-fire labeled applications; VR910 DT or VR910 NL.
 12. Provide rim exit devices at single doors. Provide two rim exit devices with keyed removable steel mullion at pairs of doors. Concealed or surface vertical rod exit devices or aluminum mullions will not be permitted except LBL-Less Bottom Latch concealed cable device may be used at double egress cross-corridor applications.
 13. Provide QEL-Quiet Electric latch Retraction at electrified exit device applications.

B. Types and Manufacturers: Panic devices

Von Duprin-No Substitution
XP99 Series (exterior)
99 Series (interior)
9949/9949-F-LBL (cross-corridor)

C. Types and Manufacturers: Mullions

Von Duprin-No Substitution
KR4954 x 154 Stabilizers
KR9954 x 499F x 154 Stabilizers

2.9 OVERHEAD SURFACE CLOSER

A. Surface Closers

1. Shall conform to ANSI A156.4, Grade 1, NFPA 80, NFPA 101 and UL10C.
2. Full rack-and-pinion type closer with non-ferrous cover and cast iron body. Double heat-treated shaft, full complement bearings, single piece forged piston, chrome silicon steel spring, non-critical screw valves; back check, sweep and latch.
3. ISO 9000 certified. Units stamped with date of manufacturer code.

4. All non-sized closer to be independent lab tested for 10,000,000 cycles.
5. Locate closers on interior side of exterior doors and on the non-public side of interior doors, unless otherwise specified. Closers are to be parallel arm mounted.
6. Closers to be non-sized, field adjustable from size 1 to 6.
7. Provide all non-sized closers with 1½" diameter piston.
8. All closers shall be mounted with through-bolts.
9. Provide plates, brackets, and special templates when needed for interface with particular header, door, and wall conditions and adjacent hardware.
10. Maximum opening force to meet ADA: Exterior doors 8.5 lb.; interior doors 5 lb.; fire doors 15 lb.
11. Spring Cush (SC) Arms at all exterior, Gym, Cafeteria, Stair, and high traffic openings.
12. Closers tested to 100 hours of ASTM B117 salt spray test, provide data on request.
13. Spring power adjustment aided by visible size indicator, i.e. "FAST Power Adjust".
14. Closers to have a stable fluid withstanding temperature range of 120 degrees to -30 degrees hydraulic fluid
15. Install closers at templating to provide maximum ADA compliance.
16. Closer products with any type of pressure relief valve system will not be acceptable.
17. Types and Manufacturers:
LCN-No Substitution
4040XP pull-side application
4040XP SCNS push-side application
18. Auto operators shall be supplied as specified in hardware set at the end of this section. Provide all labor, materials, equipment and services necessary for proper installation of the LCN Senior Swing handicap door system, a low energy power operated door system as defined in current ANSI/BHMA A159.19. All auto operators are to be installed by a certified LCN installation company. Provide Touchless actuators. Coordinate with access control system.
19. Types and Manufacturers:
LCN-No Substitution
Senior Swing Series 9530/9540

2.10 OVERHEAD HOLDERS AND STOPS:

- A. General: Provide surface-mounted overhead holder/stop of the type, design and function as specified here within.
 1. All holders shall be non-handed and provided complete with proper fasteners.
 2. All holder arms and channels shall be made of extruded bronze or stainless steel.
 3. Shock absorber to be a shock absorbing coil steel spring with a rubber insert.
 4. Provide sex bolts on all wood doors.
- B. All products herewith shall comply with the standards of ANSI/BHMA A.156.8.
- C. Types and Manufacturers:
Glynn-Johnson
ABH

2.11 ELECTRO-MAGNETIC DOOR RELEASE:

- A. General: Provide electromagnets hold open devices designed specifically to hold fire and smoke doors open until released under activation of the fire alarm system or loss of power.
 1. Faceplates shall be stainless steel for flush or surface mounting and shall fit into standard single gang electrical boxes.
 2. Assembly shall consist of an armature contact plate with adjustable pivot mounting.
 3. All units to be equipped with easy wire quick insert connectors.

4. Holding force to be 25 pounds, voltage to be 24VDC, unless otherwise approved by the Architect.
5. Types and Manufacturers:
LCN
Rixson

NOTE: ELECTRICAL CONTRACTOR SHALL PROVIDE ALL POWER WIRING, JUNCTION BOXES, CONDUIT, RECIFIERS, TRANSFORMERS ETC., INCLUDING ALL CONNECTIONS AS REQUIRED TO PROVIDE A COMPLETE OPERATIONAL SYSTEM UNDER DIVISION 16/DIVISION 28.

2.12 PUSH/PULL PLATES:

- A. General: Push plates and pull plates shall be provided as scheduled.
- B. All plates shall be drilled and countersunk approximately 6" on centers. All plates shall be provided with stainless steel Phillip's head screws with undercut heads to insure a tight bond on any type of door. All plates shall be packaged in individual envelopes, clearly marked and sized. All material shall be properly packaged to protect the finish.
- C. All products shall comply with ANSI/BHMA standards A156.6 and A156.18.
- D. All push and pull plates shall have radius corners.
- E. All push plates shall be a minimum thickness .125.
- F. All pull plates shall be a minimum thickness .050.
- G. Types and Manufacturers:
Ives
Trimco
Burns

2.13 KICK AND ARMOR PLATES:

- A. General: All kick plates and armor plates shall be .050 inch minimum thickness stainless steel, US32D. Plates to be beveled three edges (B3E), drilled and countersunk with stainless steel screws 5/8" minimum with matching finish.
- B. All plates shall be in compliance with ANSI/BHMA standards A156.6 and A156.18.
- C. Types and Manufacturers:
Ives
Trimco
Burns

2.14 MANUAL FLUSH BOLTS AND COORDINATORS:

- A. General: All flush bolts are to be manually operated and provided for pairs of doors as specified. Provide minimum length of 12" for all rods, except where any door is higher than 7'-0", provide the top bolt in a length sufficient to locate the flush bolt operator no more than 6'-0" above the finished floor. Comply with ANSI A115.4, door and frame preparation and ANSI/BHMA A156.16. Provide standard strikes with wrought boxes for top bolts. Provide dustproof strikes for bottom bolts. Coordinators are to be used only on hollow metal doors.

B. Types and Manufacturers:

Ives
Trimco
Burns

2.15 DUSTPROOF STRIKES:

A. Dustproof Floor Strikes: For 5/8" round or 1/2" square bolts.

Ives
Trimco
Burns

2.16 FLOOR AND WALL STOPS:

A. General: Provide floor and/or wall stops as indicated, unless otherwise specified.

Ives
Trimco
Burns

2.17 THRESHOLDS:

A. General: Provide thresholds of the type, finish and material as specified.

B. Fasteners shall be of stainless steel or non-ferrous material with a finish compatible with the threshold. The length of the screw used should be the proper length to allow for a minimum of 3/4" thread engagement in the floor or anchoring device used.

C. All material shall be in compliance with ANSI/BHMA standards A156.21.

D. All aluminum extrusions are to be of alloy 6063 hardness T-5.

E. Acceptable Manufacturers:

Zero
National Guard Products
Reese

2.18 WEATHERSTRIPPING/GASKETING:

A. General: Provide all gasketing, door bottoms and astragals as specified.

B. Wherever the specified materials are used in conjunction with a fire rated opening, products shall have been tested in accordance with the Underwriters Laboratories, UL10C and shall meet the requirements of positive pressure UBC 7-2.

C. All gasketing material shall be silicone and in compliance with ANSI/BHMA standard A156.22 for door gasketing systems.

D. Acceptable Manufacturers:

Zero
National Guard Products
Reese

2.19 DOOR SILENCERS:

- A. Provide for all hollow metal frames, three door silencers for each single door and two each for each pair of doors as manufactured by one of the following manufacturers.

Ives

Rockwood

Hager

2.20 KEY CONTROL SYSTEM:

- A. General: Provide a complete key system of the type specified.
- B. Provide key cabinet made of cold rolled, minimum 18-gauge furniture steel electro-welded. Doors shall have continuous brass pin piano type hinge and shall be equipped with chrome-plated locking handles, hook cam and two paracentric keys. All locks shall be nickel plated with solid brass pin tumbler cylinder keyed as directed. Key cabinet and key control system shall accommodate all keys for this project plus fifty percent expansion.
1. Key tags shall consist of two sets: Permanent self-locking and loan key snap hook type with tag colors as follows: Red fiber markers of the permanent self-locking type approximately 1-1/4" inch in diameter on, which shall be engraved the legend, "File Key Must Not Be Loaned."
 2. Also furnish for each hook a white cloverleaf key marker with snap hooks on which shall be engraved "Loan Key."

- C. The hardware supplier shall attach a key tag to each change key and shall mark thereon the respective architectural key symbol and key biting number. Each group of keys shall be contained in a key gathering envelope, which shall include the architectural key symbol, key biting number and architectural room description number.

The hardware supplier shall be responsible for properly identifying and tagging all change keys, setting up the key cabinet and key index system.

The General Contractor shall be responsible for verifying that all locksets are installed in their proper location and that the key changes operate the correct locks.

1. Key Index System Shall Include:
 - a. Hook number
 - b. Architectural key symbol
 - c. Architectural door number
 - d. Owner's revised room number
 - e. Key biting number
- D. The hardware supplier shall include in their scope of work all labor necessary to completely layout the key index system and install all keys, properly identified in the key cabinet. The permanent keys and key cabinet shall be delivered directly to the Owner.
- E. The key cabinet shall be a three-way cross index system and shall include a hardbound copy and disk, including master key listing the keys alphabetically, the hooks numerically and the key biting changes numerically. Attach the keys to the two sets of numbered tags supplied with the cabinet, permanent tag and the loan key tags. The supplier shall instruct the Owner in use of the system. The General Contractor shall install the cabinet in a location selected by the Owner.
- F. Type and Manufacturers:
1. Telkee Aristocrat AWC-450-S System

Size of system is minimum requirement, appropriate size to be provided dependent on project.

2.21 KEYS AND KEYING:

- A. Provide Best brass construction cores and keys during the construction period. Plastic construction cores will not be permitted. Construction cores shall not be part of the Owner's permanent keying system or provided on the same keyway or key section as the Owner's permanent keying system.
- B. Permanent Best cores and keys shall be prepared according to the approved keying schedule and shall be furnished to the Owner by the local Best factory representative prior to occupancy.
- C. All cylinders and cores shall be Best 7-pin, interchangeable core. Provide Best "Premium" cores at all exterior keyed openings. Best cores shall be keyed by the factory to match the existing Frederick County Public School key system.
- D. Permanent Best keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Duplication Prohibited."
- E. Grand Masterkeys, Masterkeys and other Security keys shall be transmitted to the Owner by Registered Mail, return receipt requested.
- F. Furnish keys in the following quantities:
 - 1. 4 each Grand Masterkeys
 - 2. 4 each Masterkeys per set
 - 3. 4 each Change keys each keyed core
 - 4. 9 each Construction Masterkeys
 - 5. 1 each Construction Control key
- G. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Contractor's Hardware Supplier. All Construction cores and keys remain the property of the Contractor's Hardware Supplier.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL:

- A. The Contractor shall receive all hardware for doors as shown and scheduled and as in accordance with the approved hardware schedule.
- B. Provide an adequate and secured storage area for all hardware; refer to paragraph 1.09.
- C. Install all hardware in strict accordance with the manufacturer's templates and installation procedures and workmanship, refer to paragraph 1.03.
- D. The Contractor shall turn over to the Owner any tools supplied with the hardware to adjust or maintain the hardware.
- E. In conjunction with the hardware supplier, the Contractor shall adjust and check the installation of hardware prior to acceptance by the Owner and/or Architect.

- F. The Contractor shall obtain a copy of ANSI/DHI A115.IG-1994. "Installation Guide for Doors and Hardware." It is the intent of this document to be used as a reference guide in the proper handling, storage and installation of finish hardware and doors and frames. This document can be obtained through the Door and Hardware Institute, Chantilly, VA.
- G. All hardware shall be inspected by the factory representative prior to final acceptance by FCPS to ensure proper installation and adjustment. The representative shall submit a written report to the Architect with copies to the Contractor and hardware supplier upon completion of his service. This report shall include any installation problems, noting door numbers and location along with recommendations to correct the problem.
- H. The Contractor and construction manager shall coordinate a pre-installation meeting with the hardware installers, the hardware supplier, and manufacturers' representative to review products specified and their proper installation.

3.2 ELECTRONIC ACCESS CONTROL SYSTEM REQUIREMENTS:

- A. Summary of Work: The hardware supplier shall obtain the services of Best Access Systems to provide the hardware Electronic Access Control System (EAC) under this Section. The EAC system shall be tied into Frederick County Public Schools (FCPS) existing BASIS Access Control Software System. Through the hardware supplier, electrical contractor shall provide all labor, material and services necessary to install a complete EAC system. Note, regardless of door and frame material, the EAC system shall be included in the hardware supplier scope of work. No deviations will be allowed. Card Readers shall be provided at the following doors:
 - 1. Lower Level: Doors 000A, 000C, 000E, 000F, 001B, 014A, 028A
 - 2. Upper Level: Doors 100, 100B, 100J, 100L, 100M, 100N, 100P, 100R, 101, 101G, 114B, 114D, 114I, 116A, 120, 128A, 129A, 159A, 175A,
 - 3. Roof Level: Doors 202, 204
 - 4. Add Alternate No. 01: A100D, A100G
- B. Access Control System Equipment Requirements:
Furnish the following equipment:
 - 1. One (1) Intelligent System Controller / Network Device / Communication Cable & Enclosure # BAS-2220 x LS-MSS100-1 x HOC-ETHLAN.
 - 2. Minimum of five (5) Proximity Car Reader HID 910NNNNEK2037P (Black) per school.
 - 3. Minimum of three (3) Dual Reader Interface Module BAS-1320 per school.
 - 4. Minimum of one (1) "UL" listed Power Supplies & Enclosure BAS-AL600ULM x ABT-12 per School.
 - 5. Wiring requirements are 18 gauge, 4 paired, (8 wire) twisted, shield, plenum rated "UL" listed. Note: Wire shall be provided and installed by electrical contractor. The Electrical Contractor shall provide conduit as required, under Division 16.
Note equipment shall be configured and engineered to suit overall system requirements above quantities may vary.
- C. Hardware Requirements and Door Application:
 - 1. Provide electrified hardware as specified in hardware schedule. All electrified hardware shall be interfaced with the EAC system, and be connected to the emergency generator. Regardless of door and frame material, electrified hardware shall be included in the hardware supplier scope of work.
- D. Power and Network Requirements:
 - 1. As necessary, the Electrical Contractor responsible for Division 16 shall provide switched 120V power, conduit and junction boxes at each card reader location and in the Server/Telecom room for EAC equipment. General Contractor shall be responsible for

providing a network drop at the Server/Telecom room. FCPS shall provide a dedicated IP address to security integrator before EAC system start up. EAC system consisting of card reader system and electrified hardware controlled by card access shall be tied into the emergency generator back up system. In addition, provide battery back up at Door 100 (Main Entry). Prior to installation, coordinate final location of card readers and access control equipment with FCPS.

E. Owner Provided:

1. Proximity cards shall be furnished and programmed by FCPS.

F. Submittals:

1. In accordance with Division 1, submit shop drawings and catalog cuts for approval.

END OF SECTION

3.3 SCHEDULES

Hardware List

<u>Mfg</u>	<u>Description</u>	<u>Product Number</u>	<u>Finish</u>
BE	Lockset	9K3-7D15D L/C 7/8"LTC	626
	Lockset	9K3-7D15D L/C S3	626
	Lockset	9K3-7D15D L/C S3 TL/O	626
	Lockset	9K3-7R15D L/C S3	626
	Lockset	9K3-7R15D STD S3	626
	Lockset	9K3-7W15D L/C 7/8"LTC	626AM
	Lockset	9K3-7W15D L/C S3	626AM
	Lockset	9K3-7YD15D L/C 7/8"LTC	626
	Privacy Set	9K3-0L15D S3	626
	Core	Match FCPS Stansard Cores	626
	Cormax Core	1CM-7MJ12	626
	Mortise Cylinder	1E-74 L/C	626
	Rim Cylinder	12E-72 L/C	626
	Lockset	45H-7XR14H	630
BEST	Wiring Diagram	WIRING DIAGRAM FURNISHED BY	
BY		HWDE. SUPPLIER	
	Meeting Stile Seal	By Alum. Door Mfg.	
GL	Overhead Door Holder	101H	US32D
	Overhead Door Stop	101S	US32D
HA	Hinge	BB1191 4 1/2 X 4 1/2	US32D
	Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D
	Hinge	BB1199 4 1/2 X 4 1/2	US26D
	Hinge	BB1199 4 1/2 X 4 1/2	US32D
	Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D
	Hinge	BB1199 5 X 4 1/2	US32D
	Hinge	BB1279 4 1/2 X 4 1/2	US26D
	Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D
	Continuous Hinge	661HD UL 87"	CLR
	Continuous Hinge	661HD UL 87" EPT Prep	CLR
	Continuous Hinge	780-224HD 83"	CLR
	Continuous Hinge	780-224HD 83" EPT/PREP	CLR
	Continuous Hinge	780-224HD 83" EPT/PREP UL/FF	CLR
	Continuous Hinge	780-224HD 83" UL/FF	CLR
	Continuous Hinge	780-224HD 87" EPT/PREP Q/CONNECT	CLR
HID_	Card Reader	9910NNNNEK2037P	
IV	Vandal Resistant Pull	VR910DT	US32D
	Vandal Resistant Pull	VR910NL	US32D
LC	Closer	4040 XP REG	AL
	Closer	4040 XP SCUSH 30 SHOE SUPPORT	AL
		4040-18 61 STOP SPACER	
NA	Closer	4040 XPT STD MC TORX SCREWS	AL
	Astragal	139 SP	
	Drip Cap	16 A 4"ODW	
	Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"	
	Finger Guard	2248 A 82" SMS-TEKS 8 X 3/4" TORX	
		SECURITY SCREWS 8 X 3/4"	
	Gasketing	5050 C-20 20'	
	Gasketing	5050 C-21 21'	

	Mullion Seal	5100 S	
	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"	
	Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"	
	Threshold	896HD N 48" 10-24 MS/LA	AL
	Threshold	896HD NDKB 36" 10-24 SSMS/LA	
	Threshold	896HD NDKB 72" 10-24 MS/LA	
RCIN	Door Position Switch	9540	WHITE
SC	Lockset	L9485BD 06A L283-722 L583-363	630
SDCC	Mini Console	DTMO-1	BEIGE
TECT	Weather-stripping By Alum Manf	BY OTHERS	
TR	Flush Bolt	3917-12	626
	Armor Plate	KA050 32" x 35" B4E-HEAVY-AP CSK-AP	630
	Kick Plate	KO050 10" x 1" LDW B4E CSK	630
	Kick Plate	KO050 10" x 2" LDW B4E CSK	630
	Mop Plate	KM050 4" x 1" LDW B4E CSK	630
	Floor Stop	1211	626
	Wall Bumper	1270CV	622
	Wall Bumper	1270CX	626
	Wall Bumper	1270WX	630
	Coat Hook	3072	619
	Coat Hook	3072	630
	Door Viewer	976U	625
	Door Viewer Cap	976CV	605
	Dustproof Strike	3910	630
	Lock Guard	5001	630
	Door Silencers	1229A	BLACK
VO	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28
	Dummy Push Bar	330	US26D
	Exit Device	CDSI 9947EO	US26D
	Exit Device	CDSI 9947L-NL x 996L-NL-R&V	US26D
	Exit Device	LD 98L-NL x 996L-NL-R&V 06-SS 299	US26D, US32D
	Exit Device	LD 9947WDC-EO LBR	US26D
	Exit Device	LD 99L-BE-F x 996L-R&V-BE 06	US26D
	Exit Device	LD 99L-DT x 996L-DT	US26D
	Exit Device	LD 99L-NL x 996L-NL-R&V	US26D
	Exit Device	LD QEL 9947WDC-L-NL x 996L-NL-R&V LBR	US26D
	Exit Device	LD QEL 99L-NL x 996L-NL-R&V 06 24VDC FSE	US26D
	Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D
	Exit Device	LD XP99EO	US26D
	Exit Device	LD XP99L-NL x 996L-NL-R&V	US32D, US26D
	Fire Exit Device	QEL XP99L-NL-F x 996L-NL-R&V 24VDC FSE	US32D, US26D
	Fire Exit Device	XP99EO-F	US26D
	Electric Strike	4212 S024	630
	Electric Strike	6211 24VAC CON EB FSE S024	US32D
	Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT	
	Power Transfer	EPT 10 CON	SP28

Option List

<u>Code</u>	<u>Description</u>
B	PICK & DRILL RESISTANT (1CD only)
W	WEAR RESISTANT
06	06 LEVER DESIGN-FURNISHED STANDARD
EB	Entry Buzzer for Fail-Secure
LD	LESS DOGGING
MC	METAL COVER
S3	ANSI Strike Package
299	STANDARD SURFACE STRIKE - DULL BLACK
CON	Molex Electrical Connector (6100/6200)
CON	Molex Electrical Connector (EPT 10)
CSK	COUNTER SINKING OF KICK and MOP PLATES
FSE	FAIL SECURE
FSE	FAIL SECURE-FOR ELECTRIC UNLOCKING
LBR	Less Bottom Rod for 3/35/98/9947
QEL	Quiet Electric Latch Retraction
CDSI	CYLINDER DOGGING WITH INDICATOR
S024	Rectifier Kit - 24VAC to 24VDC
TL/O	TACTILE LEVER - Outside
06-SS	06 STAINLESS LEVER DESIGN
24VAC	24VAC-VOLTAGE WITH RECTIFIER KIT
24VDC	24 VOLTS DC
UL/FF	UL FIRE RATING
900-8F	8 Fuse Protected Outputs
900-8P	8 PTC Protected Outputs
CSK-AP	COUNTER SINKING OF ARMOUR PLATES
4040-18	Drop Plate
7/8"LTC	7/8" Lip-To-Center Strike
900-2RS	2 Relay Board Output
900-4RL	4 Relay Board Output Integrated Logic
900-BAT	Batteries Only (Qty 2)
EPT/PREP	POWER TRANSFER PREP - CONCEALED MODELS
KEYWAY -	Keyway (Specify)
L283-722	Vacant/Occupied Indicator(Outside of Dr)
L583-363	DISABILITY T/TURN (Replaces XL11-800)
Q/CONNECT	Molex Quick Connect
10-24 MS/LA	10-24 MACHINE SCREW/LEAD ANCHOR
TORX SCREWS	TORX SCREW PACK
B4E-HEAVY-AP	BEVELED 4 EDGES - ARMOR PLATES
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
10-24 SSMS/LA	STAINLESS MACHINE SCREWS/LEAD ANCHOR
61 STOP SPACER	BLADE STOP SPACER-PAINTED FINISHES
30 SHOE SUPPORT	CUSH SHOE SUPPORT-PAINTED FINISHES
Less Strike Prep	Blank Mullion - Less Strike Prep
SMS-TEKS 6 X 3/4"	SELF DRILLING SCREWS 6 X 3/4"
SMS-TEKS 8 X 3/4"	SELF DRILLING SMS 8 X 3/4"
154 STABILIZER KIT	Mullion Stabilizer Kit (Steel Mullions)
TORX SECURITY SCREWS 8 X 3/4"	TORX SECURITY SCREWS 8 X 3/4"

Finish List

<u>Code</u>	<u>Description</u>
AL	Aluminum
AL	Aluminum (BHMA 689)

605	Bright Brass, Clear Coated
619	Satin Nickel Plated, Clear Coated
622	Flat Black Coated
625	Bright Chromium Plated
626	Satin Chromium Plated
630	Satin Stainless Steel
CLR	Clear Anodized
SP28	Lacquer Sprayed Aluminum
626AM	Satin Chrome - Antimicrobial Coating
BEIGE	Beige
BLACK	Black
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull
WHITE	White

Hardware Sets

SET #01 - Access: Exterior Entry ALD/F

Doors: 000A, 001B, 014A, 028A, 100, 100P

1	Continuous Hinge	780-224HD 87"	CLR	HA
1	Continuous Hinge	780-224HD 87" EPT/PREP	CLR	HA
1	Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1	Exit Device	LD XP99EO	US26D	VO
1	Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Core	Match FCPS Stansard Cores	626	BE
1	Vandal Resistant Pull	VR910DT	US32D	IV
1	Vandal Resistant Pull	VR910NL	US32D	IV
2	Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC				
		STOP SPACER		
1	Power Transfer	EPT 10 CON	SP28	VO
1	Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1	Card Reader	9910NNNNEK2037P		HID_
		NOTE: Black Finnish		
1	Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
2	Door Position Switch	9540	WHITE	RCIN
2	Meeting Stile Seal	By Alum. Door Mfg.		BY
2	Weather-stripping By Alum Manf	BY OTHERS		TECT
1	Drip Cap	16 A 4"ODW		NA
1	Mullion Seal	5100 S		NA
2	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #01.1 - Exterior Entry ALD/F

Doors: 000, 100A

2	Continuous Hinge	780-224HD 87"	CLR	HA
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1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1 Exit Device	LD XP99L-NL x 996L-NL-R&V	US32D, US26D	VO
1 Exit Device	LD XP99EO	US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Meeting Stile Seal	By Alum. Door Mfg.		BY
2 Weather-stripping By Alum Manf	BY OTHERS		TECT
1 Drip Cap	16 A 4"ODW		NA
1 Mullion Seal	5100 S		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #02 - Access: Exterior Entry HMD/F

Doors: 100J, 100R, 114B, 114D, 114I

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1 Exit Device	LD XP99EO	US26D	VO
1 Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
2 Door Position Switch	9540	WHITE	RCIN
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
2 Gasketing	5050 C-21 21'		NA
1 Mullion Seal	5100 S		NA
1 Drip Cap	16 A 4"ODW		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #03 - Access: Interior Vestibule ALD/F

Doors: 000C, 100B

1 Continuous Hinge	780-224HD 87"	CLR	HA
1 Continuous Hinge	780-224HD 87" EPT/PREP Q/CONNECT	CLR	HA

1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike	SP28	VO
	Prep		
1 Exit Device	LD 99L-DT x 996L-DT	US26D	VO
1 Exit Device	LD QEL 99L-NL x 996L-NL-R&V 06 24VDC FSE	US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNEK2037P		HID_
2 Door Position Switch	9540	WHITE	RCIN
1 Mullion Seal	5100 S		NA
2 Meeting Stile Seal	By Alum. Door Mfg.		BY
2 Weather-stripping By Alum	BY OTHERS		TECT
Manf			

SET #03.1 - Interior Vestibule/Cafeteria ALD/F

Doors: 000B, 100C, 115, 115A, 115B

2 Continuous Hinge	661HD UL 87"	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike	SP28	VO
	Prep		
1 Exit Device	LD 99L-DT x 996L-DT	US26D	VO
1 Exit Device	LD 99L-NL x 996L-NL-R&V	US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Weather-stripping By Alum	BY OTHERS		TECT
Manf			
1 Mullion Seal	5100 S		NA
2 Meeting Stile Seal	By Alum. Door Mfg.		BY

SET #03.2 - Interior Vestibule HMD/F

Doors: 100I, 100K, 114, 114A, 114C

2 Continuous Hinge	780-224HD 83"	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike	SP28	VO
	Prep		
1 Exit Device	LD 99L-DT x 996L-DT	US26D	VO
1 Exit Device	LD 99L-NL x 996L-NL-R&V	US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
2 Vandal Resistant Pull	VR910NL	US32D	IV

2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61	AL
LC		
	STOP SPACER	
2 Gasketing	5050 C-21 21'	NA
1 Mullion Seal	5100 S	NA

SET #03.3 - Interior Stairs 45Min WD/HMF

Doors: 159B, 175B

2 Continuous Hinge	780-224HD 83"	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike	SP28	VO
	Prep		
2 Exit Device	LD 99L-BE-F x 996L-R&V-BE 06	US26D	VO
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
2 Gasketing	5050 C-21 21'		NA
1 Mullion Seal	5100 S		NA

SET #03.4 - Interior Vestibule/Cafeteria ALD/F

Doors: 014, 028, 100Q

2 Continuous Hinge	661HD UL 87"	CLR	HA
2 Dummy Push Bar	330	US26D	VO
2 Vandal Resistant Pull	VR910DT	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Meeting Stile Seal	By Alum. Door Mfg.		BY
2 Weather-stripping By Alum	BY OTHERS		TECT
Manf			

SET #04 - Access: Exterior Stair Well HMD/F 45M

Doors: 159A, 175A

1 Continuous Hinge	780-224HD 83" EPT/PREP UL/FF	CLR	HA
1 Continuous Hinge	780-224HD 83" UL/FF	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike	SP28	VO
	Prep		
1 Fire Exit Device	XP99EO-F	US26D	VO
1 Fire Exit Device	QEL XP99L-NL-F x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
2 Door Position Switch	9540	WHITE	RCIN
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO

1 Card Reader	9910NNNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE.		BY
	SUPPLIER		
2 Gasketing	5050 C-21 21'		NA
1 Mullion Seal	5100 S		NA
1 Drip Cap	16 A 4"ODW		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #05 - Class Room/Planning/Health

Doors: 004, 008, 009, 010, 015, 016, 017, 018, 019, 020, 021, 021A, 022, 023, 024, 029, 030, 031, 032, 033, 102, 104, 105, 106, 113, 117, 118, 123, 124, 131, 136, 137, 142, 143, 145, 148, 149, 154, 155, 156, 157, 158, 162, 165, 166, 171, 172, 173, 174, 176

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #05.1 - Classroom/Speech

Doors: 163

3 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #05.2 - Class Room//Intervention ALD/F

Doors: 012, 026, 150, 152, 168, 170

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Floor Stop	1211	626	TR
	NOTE: Opening #012 and 026 Only		
1 Wall Bumper	1270WX	630	TR
	NOTE: Opening #150, 152, 168, and 170 Only		
1 Weather-stripping By Alum Manf	BY OTHERS		TECT

SET #05.3 - Calming/ Room

Doors: 003, 146

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7R15D STD S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #06 - Restroom Kindergarden/Grade 1-5/Health

Doors: 008A, 009A, 010A, 022A, 023A, 024A, 102D

3 Hinge	BB1191 4 1/2 X 4 1/2	US32D	HA
1 Privacy Set	9K3-0L15D S3	626	BE
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA
1 Finger Guard	2248 A 82" SMS-TEKS 8 X 3/4" TORX SECURITY SCREWS 8 X 3/4"		NA

SET #06.1 - Staff Restroom

Doors: 005, 007, 101F, 103, 114F, 116J, 131A, 131B, 144, 164

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	L9485BD 06A L283-722 L583-363	630	SC
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1 Floor Stop	1211	626	TR
NOTE: Opening #116J Only			
1 Wall Bumper	1270WX	630	TR
1 Coat Hook	3072	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #07 - Custodial Closet

Doors: 112, 132, 139

3 Hinge	BB1191 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #07.1 - Custodial Closet

Doors: 002

3 Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE

1 Closer LC	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #08 - Media/Broadcast/Office/Work Rm

Doors: 001A, 001C, 101B, 101C, 101D, 102A, 102C, 114E, 116B, 133, 134, 135, 138, 160

3 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #08.1 - Maint. Office

Doors: 125

3 Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer LC	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270CV	622	TR
1 Gasketing	5050 C-21 21'		NA

SET #09 - Storage Room

Doors: 006, 008B, 102B, 105A, 106A, 114G, 116D, 116E, 126, 130, 140, 161

3 Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
3 Door Silencers	1229A	BLACK	TR

SET #09.1 - Storage Room

Doors: 123A, 124A

3 Hinge	BB1191 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer LC	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR

1 Gasketing	5050 C-21 21'		NA
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SET #10 - Conference Room

Doors: 141

3 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #10.1 - Conference Room

Doors: 101E

3 Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #11 - Kitchen Lockers

Doors: 116K

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Coat Hook	3072	619	TR
1 Gasketing	5050 C-21 21'		NA

SET #11.1 - Platform

Doors: 115D, 115E, 115F

3 Hinge	BB1199 5 X 4 1/2	US32D	HA
1 Lockset	9K3-7R15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #11.2 - Access: MDF Room 60 Min

Doors: 120

3 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Electric Strike	4212 S024	630	VO
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1 Door Position Switch	9540	WHITE	RCIN
1 Coat Hook	3072	619	TR
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNNEK2037P		HID_
1 Gasketing	5050 C-21 21'		NA

SET #12 - Kitchen Serving

Doors: 116, 116C, 116F

6 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
2 Flush Bolt	3917-12	626	TR
1 Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Overhead Door Holder	101H	US32D	GL
2 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1 Dustproof Strike	3910	630	TR
1 Astragal	139 SP		NA
2 Door Silencers	1229A	BLACK	TR

SET #13 - Furniture Storage

Doors: 115C

6 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
2 Flush Bolt	3917-12	626	TR
1 Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
2 Closer	4040 XP REG	AL	LC
2 Overhead Door Holder	101H	US32D	GL
2 Armor Plate	KA050 32" x 35" B4E-HEAVY-AP CSK-AP	630	TR
1 Floor Stop	1211	626	TR
1 Wall Bumper	1270WX	630	TR
1 Dustproof Strike	3910	630	TR
1 Astragal	139 SP		NA
2 Door Silencers	1229A	BLACK	TR

SET #14 - Access: Exterior Main Office

Doors: 101G

1 Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
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1 Lockset	9K3-7D15D L/C S3	626	BE
1 Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910NL	US32D	IV
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Overhead Door Stop	101S	US32D	GL
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Card Reader	9910NNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1 Door Position Switch	9540	WHITE	RCIN
1 Lock Guard	5001	630	TR
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"		NA
1 Gasketing	5050 C-21 21'		NA
1 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #14.1 - Access: Exterior Kitchen

Doors: 116A

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Electric Strike	6211 24VAC CON EB FSE S024	US32D	VO
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Overhead Door Stop	101S	US32D	GL
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Card Reader	9910NNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1 Door Position Switch	9540	WHITE	RCIN
1 Door Viewer	976U	625	TR
1 Lock Guard	5001	630	TR
1 Door Viewer Cap	976CV	605	TR
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"		NA
1 Gasketing	5050 C-21 21'		NA
1 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #14.2 - Access: Penthouse IDF Room

Doors: 202, 204

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Electric Strike	6211 24VAC CON EB FSE S024	US32D	VO
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			

	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE.		BY
	SUPPLIER		
1 Door Position Switch	9540	WHITE	RCIN
1 Lock Guard	5001	630	TR
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNNEK2037P		HID_
1 Drip Cap	16 A 40" SMS-TEKS 8 X 3/4"		NA
1 Gasketing	5050 C-21 21'		NA
1 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #15 - Access: Exterior Elect/Mech Room

Doors: 128A, 129A

1 Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1 Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910NL	US32D	IV
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE.		BY
	SUPPLIER		
1 Door Position Switch	9540	WHITE	RCIN
1 Door Viewer	976U	625	TR
1 Door Viewer Cap	976CV	605	TR
1 Drip Cap	16 A 4"ODW		NA
1 Gasketing	5050 C-20 20'		NA
1 Door Sweep	101 VA 48" SMS-TEKS 8 X 3/4"		NA
1 Threshold	896HD N 48" 10-24 MS/LA	AL	NA

SET #16 - Ourdoor Storage

Doors: 127

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Drip Cap	16 A 4"ODW		NA
1 Gasketing	5050 C-20 20'		NA
1 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #16.1 - Penthouse Roof

Doors: 206, 208

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	9K3-7W15D L/C S3	626AM	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC	STOP SPACER		
1 Overhead Door Holder	101H	US32D	GL
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Door Position Switch	9540	WHITE	RCIN
1 Drip Cap	16 A 4"ODW		NA
1 Gasketing	5050 C-20 20'		NA
1 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #17 - OutDoor Storage

Doors: 114H

2 Continuous Hinge	780-224HD 83"	CLR	HA
2 Flush Bolt	3917-12	626	TR
1 Lockset	9K3-7D15D L/C 7/8"LTC	626	BE
2 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC	STOP SPACER		
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1 Dustproof Strike	3910	630	TR
1 Drip Cap	16 A 4"ODW		NA
1 Astragal	139 SP		NA
2 Gasketing	5050 C-21 21'		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #17.1 - Penthouse Roof

Doors: 205, 207, 209

2 Continuous Hinge	780-224HD 83"	CLR	HA
2 Flush Bolt	3917-12	626	TR
1 Lockset	9K3-7W15D L/C 7/8"LTC	626AM	BE
2 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC	STOP SPACER		
2 Overhead Door Holder	101H	US32D	GL
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1 Dustproof Strike	3910	630	TR
2 Door Position Switch	9540	WHITE	RCIN
2 Gasketing	5050 C-21 21'		NA
1 Drip Cap	16 A 4"ODW		NA
1 Astragal	139 SP		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA

1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA
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SET #18 - Mechanical Room/O&M Stair

Doors: 119, 128

3 Hinge	BB1199 4 1/2 X 4 1/2	US26D	HA
1 Lockset	9K3-7D15D L/C S3 TL/O	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #18.1 - Elevator Machine Room

Doors: 147

3 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1 Lockset	9K3-7D15D L/C S3 TL/O	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #18.2 - Penthouse Stair A&B

Doors: 201, 203

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	9K3-7W15D L/C S3	626AM	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #19 - Electrical Room

Doors: 129

3 Hinge	BB1199 4 1/2 X 4 1/2 NRP	US32D	HA
1 Exit Device	LD 98L-NL x 996L-NL-R&V 06-SS 299	US26D, US32D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Floor Stop	1211	626	TR

1 Gasketing	5050 C-20 20'		NA
1 Threshold	896HD NDKB 36" 10-24 SSMS/LA		NA

SET #20 - Access: Admin Recept Area Vesti ALD/F

Doors: 101

1 Continuous Hinge	780-224HD 87"	CLR	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Electric Strike	6211 24VAC CON EB FSE S024	US32D	VO
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
1 Wiring Diagram	STOP SPACER WIRING DIAGRAM FURNISHED BY HWDE. SUPPLIER		BY
1 Door Position Switch	9540	WHITE	RCIN
1 Mini Console	DTMO-1	BEIGE	SDCC
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNNEK2037P		HID_
1 Weather-stripping By Alum Manf	BY OTHERS		TECT

SET #20.1 - Admin Reception Area Corridor ALD/F

Doors: 101A

1 Continuous Hinge	780-224HD 87"	CLR	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
1 Weather-stripping By Alum Manf	STOP SPACER BY OTHERS		TECT

SET #21 - Cross Corridor

Doors: 000E, 000F, 100L, 100M, 100N

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1 Exit Device	LD QEL 9947WDC-L-NL x 996L-NL-R&V LBR	US26D	VO
1 Exit Device	LD 9947WDC-EO LBR	US26D	VO
2 Rim Cylinder	12E-72 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
2 Overhead Door Holder	STOP SPACER 101H	US32D	GL
2 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNNEK2037P		HID_
1 Wiring Diagram	WIRING DIAGRAM FURNISHED BY HWDE.		BY

2 Door Position Switch	SUPPLIER		
1 Gasketing	9540	WHITE	RCIN
	5050 C-21 21'		NA

SET #22 - Interior Stairs A&B 45Min

Doors: 158A, 175

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Exit Device	LD 99L-BE-F x 996L-R&V-BE 06	US26D	VO
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Floor Stop	1211	626	TR
1 Gasketing	5050 C-21 21'		NA

SET #23 - Media Center Entry Doors

Doors: 001

2 Continuous Hinge	780-224HD 83"	CLR	HA
1 Exit Device	CDSI 9947L-NL x 996L-NL-R&V	US26D	VO
1 Exit Device	CDSI 9947EO	US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
2 Mortise Cylinder	1E-74 L/C	626	BE
3 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Meeting Stile Seal	By Alum. Door Mfg.		BY
2 Weather-stripping By Alum Manf	BY OTHERS		TECT

SET #24 - Alternate #1 Access: Ext Entry HMD/F

Doors: A100D, A100G

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Continuous Hinge	780-224HD 83" EPT/PREP	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
1 Exit Device	LD XP99EO	US26D	VO
1 Exit Device	LD QEL XP99L-NL x 996L-NL-R&V 24VDC FSE	US32D, US26D	VO
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Core	Match FCPS Stansard Cores	626	BE
1 Vandal Resistant Pull	VR910DT	US32D	IV
1 Vandal Resistant Pull	VR910NL	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC			
	STOP SPACER		
2 Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1 Power Transfer	EPT 10 CON	SP28	VO
1 Power Supply	PS904 900-2RS 900-4RL 900-8F 900-8P 900-BAT		VO
1 Card Reader	9910NNNEK2037P		HID
2 Door Position Switch	9540	WHITE	RCIN

1 Mullion Seal	5100 S		NA
1 Drip Cap	16 A 4"ODW		NA
2 Gasketing	5050 C-21 21'		NA
2 Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1 Threshold	896HD NDKB 72" 10-24 MS/LA		NA

SET #25 - Alternate #1 Inter Vest HMD/F

Doors: 100E, A100F, A100H

2 Continuous Hinge	780-224HD 83"	CLR	HA
1 Mullion	KR4954 10'6" 154 STABILIZER KIT Less Strike Prep	SP28	VO
2 Dummy Push Bar	330	US26D	VO
2 Vandal Resistant Pull	VR910DT	US32D	IV
2 Closer	4040 XP SCUSH 30 SHOE SUPPORT 4040-18 61		AL
LC	STOP SPACER		
2 Gasketing	5050 C-21 21'		NA
1 Mullion Seal	5100 S		NA

SET #26 - Alternate #1 Class Room

Doors: A108, A110, A113

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #27 - Alternate #1 Restroom

Doors: A101F, A111

3 Hinge	BB1199 4 1/2 X 4 1/2	US32D	HA
1 Lockset	L9485BD 06A L283-722 L583-363	630	SC
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1 Floor Stop	1211	626	TR
1 Wall Bumper	1270WX	630	TR
1 Coat Hook	3072	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #28 - Alternate #1 Custodial Closet 45Min

Doors: A112

3 Hinge	BB1191 4 1/2 X 4 1/2	US32D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR

1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #29 - Alternate #1 Office/Main Office 45Min

Doors: A101G, A107

3 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Lockset	9K3-7D15D L/C S3	626	BE
1 Core	Match FCPS Stansard Cores	626	BE
1 Closer	4040 XP REG	AL	LC
1 Kick Plate	KO050 10" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270WX	630	TR
1 Gasketing	5050 C-21 21'		NA

SET #30 - Alternate #1 Restraint Room

Doors: A109

1 Continuous Hinge	780-224HD 83"	CLR	HA
1 Lockset	45H-7XR14H	630	BEST
NOTE: Two Cylinders Required			
1 Lockset	9K3-7YD15D L/C 7/8"LTC	626	BE
2 Cormax Core	1CM-7MJ12	626	BE
2 Mortise Cylinder	1E-74 L/C	626	BE
1 Closer	4040 XPT STD MC TORX SCREWS	AL	LC
1 Wall Bumper	1270CX	626	TR
1 Gasketing	5050 C-21 21'		NA

Manufacturer List

<u>Code</u>	<u>Name</u>
BE	Best Access Systems
BEST	BEST
BY	By Others
GL	Glynn Johnson
HA	Hager
HID_	HID Global Corporation
IV	Ives
LC	LCN Closers
NA	National Guard
RCIN	Rutherford Controls Int'l Corp
SC	Schlage
SDCC	Security Door Controls
TECT	Tectus by Simonswerk
TR	Trimco
VO	Von Duprin

Opening List

Building Area: Office

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
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133	08		N	F1
134	08		N	F1
135	08		N	F1
138	08		G	F1
160	08		G	F1
101B	08		N	F1
101C	08		N	F1
101D	08		N	F1
102A	08		N	F1
102C	08		N	F1
114E	08		N	F1
116B	08		N	F1
A107	29	45Min	N	F1

Building Area: Planning

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
004	05		N	F1
145	05		N	F1

Building Area: Platform

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
115D	11.1		F	F1
115E	11.1		F	F1
115F	11.1		F	F1

Building Area: Restroom

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
005	06.1		F	F1
007	06.1		F	F1
103	06.1		F	F1
144	06.1		F	F1
164	06.1		F	F1
101F	06.1		F	F1
114F	06.1		F	F1
116J	06.1		F	F1
131A	06.1		F	F1
131B	06.1		F	F1
A111	27		F	F1
A101F	27		F	F1

Building Area: Book Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
117	05		N	F1

Building Area: Cafeteria

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
115	03.1		FGFG	ALF
115A	03.1		FGFG	ALF
115B	03.1		FGFG	ALF

Building Area: Classroom

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
008	05		G	F1
009	05		G	F1
010	05		G	F1
015	05		G	F1
016	05		G	F1
017	05		G	F1
018	05		G	F1
019	05		G	F1
020	05		G	F1
021	05		G	F1
022	05		G	F1
023	05		G	F1
024	05		G	F1
029	05		G	F1
030	05		G	F1
031	05		G	F1
032	05		G	F1
033	05		G	F1
105	05		G	F1
106	05		G	F1
148	05		G	F1
149	05		G	F1
154	05		G	F1
155	05		G	F1
156	05		G	F1
157	05		G	F1
158	05		G	F1
162	05		G	F1
165	05		G	F1
166	05		G	F1
171	05		G	F1
172	05		G	F1
173	05		G	F1
174	05		G	F1
176	05		G	F1
021A	05		G	F1
A108	26		N	F1
A110	26		N	F1
A113	26		N	F1

Building Area: D&M Stair

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
119	18		F	F1

Building Area: Gymnasium

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
114	03.2		GG	F1
114A	03.2		GG	F1

Building Area: Music Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
123	05		N	F1
124	05		N	F1

Building Area: Main Office

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
A101G	29	45Min	F	F1

Building Area: Calming Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
003	05.3		N	F1
146	05.3		N	F1

Building Area: Cooridor 100

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
100K	03.2		FF	F1

Building Area: Health Suite

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
102	05		F	F1

Building Area: Intervention

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
012	05.2		FG	ALF
026	05.2		FG	ALF
136	05		N	F1
137	05		N	F1
142	05		N	F1
143	05		N	F1
150	05.2		FG	ALF
152	05.2		FG	ALF
168	05.2		FG	ALF
170	05.2		FG	ALF

Building Area: Storage Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
006	09		F	F1
126	09	60Min	F	F1
130	09		F	F1
140	09		F	F1
161	09		F	F1
008B	09		F	F1
102B	09		F	F1
105A	09		F	F1
106A	09		F	F1
116D	09		F	F1
116E	09		F	F1
123A	09.1		F	F1
124A	09.1		F	F1

Building Area: Maint. Office

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
125	08.1		F	F1

Building Area: Restraint Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
A109	30	45Min	N	F1

Building Area: Conference Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
141	10		N	F1
101E	10.1		N	F1

Building Area: Electrical Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
129	19		F	F1

Building Area: Kitchen Lockers

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
116K	11		F	F1

Building Area: Kitchen Serving

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
116	12		FGFG	F1
116C	12		FGFG	F1
116F	12		FGFG	F1

Building Area: Mechanical Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
128	18		F	F1

Building Area: Outdoor Storage

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
127	16		F	F1
114H	17		FF	F1

Building Area: Parent Workroom

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
118	05		N	F1

Building Area: Access: MDF Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
120	11.2	60Min	F	F1

Building Area: Area A Penthouse

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
205	17.1		FF	F1
206	16.1		F	F1

Building Area: Area B Penthouse

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
207	17.1		FF	F1
208	16.1		F	F1

Building Area: Area D Penthouse

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
209	17.1		FF	F1

Building Area: Broadcast Studio

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
001C	08		N	F1

Building Area: Classroom/Speech

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
163	05.1		N	F1

Building Area: Community Liason

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
113	05		F	F1

Building Area: Custodial Closet

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
112	07		F	F1
132	07		F	F1
139	07		F	F1
114G	09		F	F1
A112	28	45Min	F	F1

Building Area: Stairs/Penthouse

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
201	18.2		N	F1
203	18.2		N	F1

Building Area: Teacher's Lounge

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
104	05		N	F1

Building Area: Custodial Closet

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
002	07.1		F	F1

Building Area: Furniture Storage

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
115C	13		FF	F1

Building Area: Interior Vestibule

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
014	03.4		FGFG	ALF
028	03.4		FGFG	ALF
100E	25		GG	F1
100Q	03.4		FGFG	ALF
A100F	25		GG	F1

Building Area: Media Center Entry

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
001	23		FGFG	ALF
001B	01		FGFG	ALF

Building Area: Access: Calaboration

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
100P	01		FGFG	ALF

Building Area: Admin Reception Area

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
101A	20.1		FG	ALF

Building Area: Area A Penthouse/IDF

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
202	14.2		F	F1

Building Area: Area B Penthouse/IDF

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
204	14.2		F	F1

Building Area: Media Office/Work Rm

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
001A	08		G	F1

Building Area: Restroom First Grade

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
009A	06		F	F1

Building Area: Elevator Machine Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
147	18.1		F	F1

Building Area: Restroom Kindergarden

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
008A	06		F	F1
010A	06		F	F1
022A	06		F	F1
023A	06		F	F1
024A	06		F	F1

Building Area: Access: Cross Corridor

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
000E	21		GG	F1
000F	21		GG	F1
100M	21		GG	F1
100N	21		GG	F1

Building Area: Access: Exterior Entry

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
000	01.1		FGFG	ALF
100	01		FGFG	ALF
000A	01		FGFG	ALF
014A	01		FGFG	ALF
028A	01		FGFG	ALF
100A	01.1		FGFG	ALF
100J	02		GG	F1
100R	02		GG	F1
114B	02		FF	F1
114D	02		FF	F1
114I	02		FF	F1
A100D	24		GG	F1
A100G	24		GG	F1

Building Area: Interior Stair A 45Min

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
158A	22	45Min	N	F1
159B	03.3	45Min	NN	F1

Building Area: Interior Stair B 45Min

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
175	22	45Min	N	F1
175B	03.3	45Min	NN	F1

Building Area: Restroom Health Center

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
102D	06		F	F1

Building Area: Access: Exterior Kitchen

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
116A	14.1		F	F1

Building Area: Custodial Office/Lockers

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
131	05		F	F1

Building Area: Interior Vestibule 45Min

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
A100H	25		GG	F1

Building Area: Interior Vestibule Entry

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
100I	03.2		GG	F1
114C	03.2		FF	F1

Building Area: Access: Cross Corridor 100

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
100L	21		FF	F1

Building Area: Access: Exterior Mech Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
128A	15		F	F1

Building Area: Access: Interior Vestibule

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
000B	03.1		FGFG	ALF
000C	03		FGFG	ALF
100B	03		FGFG	ALF
100C	03.1		FGFG	ALF

Building Area: Access: Exterior Elect Room

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
129A	15		F	F1

Building Area: Access: Exterior Stair Well

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
159A	04	45Min	FF	F1
175A	04	45Min	FF	F1

Building Area: Access: Admin Reception Area

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
101	20		FG	ALF

Building Area: Access: Exterior Main Office

<u>Opening</u>	<u>Hdw Set</u>	<u>Opening Label</u>	<u>Door Type</u>	<u>Frame Type</u>
101G	14		F	F1

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass.
- B. Fire-Rated glazing.
- C. Glazing compounds and accessories.
- D. Perimeter Seals

1.2 REFERENCE STANDARDS

- A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1036 - Standard Specification for Flat Glass.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- H. GANA (GM) - GANA Glazing Manual; Glass Association of North America.
- I. GANA (SM) - GANA Sealant Manual; Glass Association of North America.
- J. GANA (LGDG) - Laminated Glazing Reference Manual; Glass Association of North America.

1.3 SUBMITTALS

- A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For glass provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For glass provide Material Ingredient Report.
- D. Samples: Submit two samples 12" x 12" inch in size of glass and plastic units, showing coloration and design.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

1.5 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.

1.6 WARRANTY

- A. See Section 01 7800 - 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 ten (10) year warranty to include coverage for delamination, including replacement of failed units.
- D. Insulated Fire-Rated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

NOTE: ALL GLAZING TO BE GASKET GLAZED UNLESS NOTED OTHERWISE.

2.1 GLAZING TYPES

NOTE: All insulating glass units are to meet the following minimum requirements, unless noted otherwise:

1. U-Value: Less than 0.30
 2. Solar Heat Gain Coefficient (SHGC): Less than 0.40
- A. Type GL-01 - Sealed Insulating Glass Units: Vision glazing, Low-E.
 1. Application(s): All exterior glazing unless otherwise indicated.
 2. Outboard Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E type, on #2 surface.
 3. Inboard Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Tint: Clear.
 4. Total Thickness: 1 inch.
 5. Total Visible Light Transmittance: 70 percent , minimum.
 6. Total Solar Heat Gain Coefficient: 0.40, minimum.
 7. Location: Where indicated on drawings.
 - B. Type GL-02 - Sealed Insulating Laminated Safety Glass Units: Vision glazing, Low-E
 1. Application(s): Exterior doors, sidelites, and transoms.
 2. Outboard Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E type, on #2 surface.

3. Inboard Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Tint: Clear.
 - b. Interlayer: Vanceva Clear Film Lamination
 4. Total Thickness: 1 inch.
 5. Total Visible Light Transmittance: 70 percent , minimum.
 6. Total Solar Heat Gain Coefficient: 0.40, minimum.
 7. Location: Where indicated on drawings.
- C. Type GL-03 - Sealed Insulated Patterned Glazing.
1. Application: Provide this type of glazing in the following locations:
 - a. Locations indicated on the drawings.
 2. Outboard Lite: - 1/4 inch Fully tempered Oldcastle Glass Clear w/ Simulated Acid Etch Ceramic Frit Silk-Screened #2 Hole Pattern 60%; Coverage Paint Number #20-8090, or approved equal.
 3. Between-lite space filled with air.
 4. Inboard Lite: 1/4 inch Fully tempered PPG Solarban 60 on Clear Low-E #3 as Basis of Design or Approved equal.
 5. Total Thickness: 1 inch.
- D. Type GL-04 - Sealed Insulating Glass Units: Ceramic Frit Spandrel Glazing.
1. Application: Provide this type of glazing in the following locations:
 - a. Locations indicated on the drawings.
 2. Basis of Design: PPG Industries, Inc: www.ppgideascales.com.
 3. Between-lite space filled with air.
 4. Outboard Lite: Fully tempered float glass, 1/4 inch thick .
 - a. Tint: Clear.
 5. Inboard Lite: Fully tempered float glass, 1/4" inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Custom Ceramic Frit, on #4 surface to protect coating.
 - c. Opacifier Color: Sherwin Williams; color to be selected from manufacturer's full range.
 6. Total Thickness: 1 1/16 inch.
 7. Glazing Method: Gasket glazing.
- E. Type GL-05 - Laminated Safety glazing.
1. Application(s): Interior Doors, Sidelites and Transoms as indicated in drawings.
 2. Outboard Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Coating: None
 - b. Tint: None (clear).
 3. Interlayer: Vanceva Clear Film Lamination, or approved equal.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Coating: None/
 - b. Tint: None (clear).
 5. Total Thickness: 9/16 inch.
- F. Type GL-06 - Single Interior Vision Safety Glazing:
1. Application: Interior glazing where indicated.
 2. Lite: Fully tempered float glass, 1/4 inch thick , minimum.
 - a. Tint: Clear.
 - b. Coating: None.
 3. Total Thickness: 1/4 inch.
 4. Location: Where indicated on drawings.
- G. Type GL-07 - Fire-Rated Safety Glass: Vision glazing.

1. Application: Provide this type of glazing in the following locations:
 - a. Fire-rated doors at stairs as indicated on the drawings.
 - b. Fire-rated window assemblies as indicated on the drawings.
2. Basis of Design: 60 Minute SuperLite II-XL Clear Glass by Safitfirst.
3. Fire Rating: 60 minute minimum.
4. Type: Monolithic and tempered glass unit.
5. Thickness: As required for fire-rating.
6. Impact Safety Rating: Category I and II.

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 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.
- B. Sustainable Design Requirements
 1. Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 2. Provide Material Ingredient Report.

2.3 GLASS MATERIALS

- A. Float Glass Manufacturers:
 1. AGC Glass Company North America, Inc: www.us.agc.com.
 2. Cardinal Glass Industries: www.cardinalcorp.com.
 3. Guardian Industries Corp: www.sunguardglass.com.
 4. Pilkington North America Inc: www.pilkington.com/na.
 5. PPG Industries, Inc: www.ppgideascape.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.
 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.

2.4 SEALED INSULATING GLASS UNITS

- A. Sealed Insulating Glass Units: Types as indicated.
 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Edge Spacers: Warm edge. stainless steel
 3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 4. Purge interpane space with dry hermetic air.

2.5 GLAZING COMPOUNDS

- A. Butyl Sealant : Single component; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; Shore A hardness of 10 to 20; black color; non-skinning.

- B. Silicone Sealant : Single component; neutral 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; black color.

2.6 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 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 C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application , self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; size recommended by manufacturer; black color.
 - 1. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. Tremco Global Sealants: www.tremcosealants.com.
 - c. Approved equal.
- D. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal; ____x____ inch size.
 - 1. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. Saint-Gobain Performance Plastics: www.plastics.saint-gobain.com.
 - c. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.7 ADDITIONAL MATERIALS:

- A. Provide one (1) of each size and type of glazing unit.

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. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

- E. 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 WET/DRY METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
- E. Fill gaps between pane and applied stop with silicone type sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.

3.6 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.7 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 9100 - LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.2 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
- C. AMCA 511 - Certified Ratings Program for Air Control Devices.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.3 SUBMITTALS

- A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 4: BPDO - Material Ingredients
 - a. For louvers provide Material Ingredient Report.
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.
- D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.5 WARRANTY

- A. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
 - 1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Louvers:
 - 1. Airolite Company, LLC: www.airolite.com/#sle.
 - 2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 3. Greenheck Fan Corporation: www.greenheck.com.

2.2 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
 - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
 - 2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
 - 3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 4. Hinged Units: Provide secondary frame to which louver frame is attached; non-ferrous hinges.
- B. Stationary Louvers: Horizontal blade, formed galvanized steel sheet construction, with intermediate mullions matching frame.
 - 1. Free Area: 50 percent, minimum.
 - 2. Blades: Drainable.
 - 3. Frame: 6 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
 - 4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
 - 5. Steel Thickness, Galvanized: Frame 16 gage, 0.0598 inch minimum base metal; blades 16 gage, 0.0598 inch minimum base metal.
 - 6. Steel Finish: Superior performing organic coatings, finished after fabrication.
 - 7. Color: Custom, to match approved sample.
- C. Operable Louvers: Operable horizontal blades, extruded aluminum construction.
 - 1. Free Area: 50 percent, minimum.
 - 2. Operation: Gravity balanced, 90 degree opening. with adjustment device to permit setting for varying differential static pressure.
 - 3. Operation: Actuator provided in HVAC control system.
 - 4. Movable Blades: Straight, pivoted at, with vinyl, rubber, or polyethylene blade edge and jamb seals; rattle-free linkage.
 - 5. Fixed Blades: Drainable.
 - 6. Frame: 6 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.

7. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
 8. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
 9. Metal Thickness: Frame 0.06 inch; blades 0.06 inch.
 10. Finish: Polyvinylidene fluoride coating, finish welded units after fabrication.
 11. Color: Custom, to match approved sample.
- D. Acoustical Louvers: Horizontal blade, formed aluminum sheet construction.
1. Sound Attenuation: Minimum sound transmission loss of 10 db at 63 Hz, when tested in accordance with ASTM E90.
 2. Free Area: 50 percent, minimum.
 3. Blades: Straight, sloped at 45 degrees, with insulating material in cavity, lower surface covered with perforated sheet metal of same type as blades.
 4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
 5. Aluminum Finish: Mill finish; finish welded units after fabrication.
 6. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
 7. Metal Thickness: Frame 0.06 inch; blades 0.06 inch.
 8. Finish: Polyvinylidene fluoride coating, finish welded units after fabrication.
 9. Color: Custom, to match approved sample.

2.3 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- C. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.
- D. Primer: Zinc chromate, alkyd type.
- E. Sustainable Design Requirements:
1. Provide Material Ingredient Report.

2.4 ACCESSORIES

- A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- C. Fasteners and Anchors: Galvanized steel.
- D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

3.2 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Coordinate with installation of flashings by others.
- C. Install louvers level and plumb.
- D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Install perimeter sealant and backing rod in accordance with Section 07 9005.
- G. Coordinate with installation of mechanical ductwork.
- H. Coordinate with installation of louver actuators.

3.3 ADJUSTING

- A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.4 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Acoustic (sound-dampening) wall and ceiling board.

1.2 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- G. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.
- H. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- K. ASTM E413 - Classification for Rating Sound Insulation.
- L. GA-216 - Application and Finishing of Gypsum Panel Products.
- M. GA-600 - Fire Resistance Design Manual.
- N. UL (FRD) - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For gypsum board and steel framing: Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 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.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For gypsum board, sound attenuation blanket, joint compound provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For gypsum board and insulation installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 3 years of documented experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Sound-Rated: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90/ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies as indicated on Drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).
- D. Sustainable Design Requirements
 - 1. Provide Material Ingredient Report.
 - 2. For gypsum board and insulation installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
 - 3. Provide Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 4. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 5. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

2.2 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 - 4. USG Corporation; ____: www.usg.com/#sle.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces, unless otherwise indicated.
 - 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 5. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 6. Thickness: 5/8 inch unless otherwise indicated on Drawings.
- C. Abuse Resistant Wallboard:
 - 1. Application: All non-tiled wall surfaces to 4'-0" AFF..
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Type: Fire resistance rated Type X, UL or WH listed.
 - 4. Thickness: 5/8 inch.
 - 5. Edges: Tapered.
- D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 - 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Type: Type X, in locations indicated.
 - 5. Edges: Tapered.
- E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings, unless otherwise indicated.
 - 2. Type: Type C at fire-rated assemblies.
 - 3. Thickness: 1/2 inch.
 - 4. Edges: Tapered.
- F. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper faced, high density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating as indicated or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
 - 1. Thickness: 5/8 inch unless otherwise indicated.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

- G. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
 - 2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
 - 3. Types: Type X, in locations indicated.
 - 4. Edges: Tapered.

2.3 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness as indicated.
- B. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional corner bead and control joints, provide L-bead at exposed panel edges unless noted otherwise.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 - 1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
 - 2. Architectural Reveal Beads:
 - a. Shapes: As shown on Drawings.
 - 3. Expansion Joints: V-shaped PVC with tear away fins.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Ready-mixed vinyl-based joint compound.
 - 4. Powder-type vinyl-based joint compound.
 - 5. Chemical hardening type compound.
- E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.2 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

3.3 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
 - 1. Seal joints, cut edges, and holes with water resistant sealant.
- G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations shown on the Drawings. Provide vent area specified.

3.5 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 3: Walls to receive textured wall finish.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Taping, filling and sanding is not required at base layer of double layer applications.

3.6 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.2 REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- 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.
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- H. ASTM E413 - Classification for Rating Sound Insulation.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For steel framing: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials

- a. For recycled content 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 provide Material Ingredient Report

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 DESCRIPTION

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING MATERIALS

- A. Sustainable Design Requirements:
 - 1. Provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.
 - 4. Provide Material Ingredients Report.
- B. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.
- C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C shaped with flat or formed webs with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 - 5. Thickness: 20 gauge (min).
- D. Loadbearing Studs: As specified in Section 05 4000.
- E. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

- F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.
- G. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- H. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- I. Fasteners: ASTM C1002 self-piercing tapping screws.
- J. Sheet Metal Backing: 0.036 inch thick, galvanized.
- K. Anchorage Devices: Powder actuated.
- L. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
- M. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- 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 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure in all locations, unless shown otherwise on drawings.
- C. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

- D. Align and secure top and bottom runners at 24 inches on center.
- E. At partitions indicated with an acoustic rating:
 - 1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
- F. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
 - 1. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Install studs vertically at 12, 16 or 24 inches on center, to meet specified performance requirements.
- I. Align stud web openings horizontally.
- J. Secure studs to tracks.
- K. Stud splicing is not permissible.
- L. Fabricate corners using a minimum of three studs.
- M. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- N. Brace stud framing system rigid.
- O. Coordinate erection of studs with requirements of all openings; install supports and attachments.
- P. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- Q. Blocking: Use wood blocking secured to studs. Provide blocking where indicated, and for support of toilet partitions, wall cabinets, toilet accessories, and other wall mounted accessories.
- R. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.3 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

3.4 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for wall applications.
- B. Stone thresholds.
- C. Ceramic trim.
- D. Non-ceramic trim.

1.2 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement.
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar.
- L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- M. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.

- N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar.
- O. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- Q. ANSI A137.2 - American National Standard Specifications for Glass Tile.
- R. ASTM C150/C150M - Standard Specification for Portland Cement.
- S. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For tile and grout provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For grout, underlayment, cement board, and waterproofing membrane provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For cement board, underlayment, and waterproofing membrane installed within the building interior: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than 15 of each type.
- E. LEED Submittal: Documentation of recycled content and location of manufacture.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6 MOCK-UP

- A. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.

1. Minimum size of mock-up is indicated on drawings.
2. Approved mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

- A. Sustainable Design Requirements:
 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 2. Provide Material Ingredient Report.
 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- B. Manufacturers: All products by the same manufacturer.
 1. American Olean Corporation: www.americanolean.com/#sle.
 2. Dal-Tile Corporation: www.daltile.com/#sle.
 3. Tectura Designs, a division of Wausau Tile Inc: www.tecturadesigns.com/#sle.

2.2 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching cove base ceramic shapes in sizes coordinated with field tile.
 1. Applications:
 - a. Inside Corners: Jointed.
 - b. Floor to Wall Joints: Cove base.
 2. Manufacturers: Same as for tile.
- B. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application and as indicated on drawings, for setting using tile mortar or adhesive.
 1. Products:
 - a. Schluter-Systems Rondec: www.schluter.com
 - b. Genesis APS International Round Edge: www.genesis-aps.com
 2. Applications:
 - a. Open edges of wall tile
 - 1) Wainscot top
 - 2) Wainscot top with return
 - b. Outside wall corners.
- C. Thresholds: Marble, white or gray, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
 1. Material: Quartz-based stone.
 2. Finish: Polished.

3. Edges: Double beveled, as indicated.
4. Nominal Thickness; 1/2 inch.
5. Width: 2 inches wide by full width of wall or frame opening, without holes, cracks or open seams.
6. Applications:
 - a. At doorways where tile terminates.
 - b. At open edges of floor tile where adjacent finish is a different height.

2.3 SETTING MATERIALS

- A. Setting and grout materials shall be provided from the same manufacturer.
- B. Manufacturers:
 1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
 2. LATICRETE International, Inc: www.laticrete.com/#sle.
 3. Mapei Corporation: www.mapei.com.
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Applications: Use this type of bond coat for wall tile installation.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. Shall comply with requirements for non-sagging mortar.
- D. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
 1. Applications: Use this type of bond coat for floor tile installation.
- E. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.4 GROUTS

- A. Setting and grout materials shall be provided from the same manufacturer.
- B. Manufacturers:
 1. ARDEX Engineered Cements; _____: www.ardexamericas.com/#sle.
 2. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 3. Mapei Corporation: www.mapei.com.
- C. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
- D. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
 1. Applications: Where indicated.
 2. Color(s): As selected by Architect from manufacturer's full line.

2.5 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
 1. Applications: Between tile and plumbing fixtures.
 2. Color(s): As selected by Architect from manufacturer's full line.

- 3. Products:
 - a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
 - c. Mapei Corporation: www.mapei.com.
- B. Tile Sealer: Stain protection for natural stone.
- C. Grout Release: Temporary, water-soluble pre-grout coating.

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 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.

3.3 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.

- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - WALL TILE

- A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.
- B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.
- C. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.5 CLEANING

- A. Clean tile and grout surfaces.

3.6 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For acoustical ceiling panels and steel suspension system: Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 3: BPDO - Sourcing of Raw Materials
 - a. For recycled content acoustical ceiling panels and steel suspension system: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. MR Credit 4: BPDO - Material Ingredients
 - a. For acoustical ceiling panels and steel suspension system provide Material Ingredient Report.
 - 4. EQ Credit 2: Low-Emitting Materials
 - a. For acoustical ceiling panels: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- D. Samples: Submit two samples 6x6 inch in size illustrating material and finish of acoustical units.

- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Acoustical Units: Quantity equal to 2 percent of total installed.

1.5 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 FIELD CONDITIONS

- A. Maintain uniform temperature within range recommended by manufacturer, but not less 60 degrees F, with a maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc; ____: www.armstrong.com/#sle.
 - 2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
 - 3. USG; ____: www.usg.com/#sle.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

- A. Sustainable Design Requirements:
 - 1. Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.
 - 3. Provide Material Ingredient Report.
 - 4. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification
- B. Acoustical Units - General: ASTM E1264, Class A.
- C. Acoustical Panels - Ceiling Type 1.11: Painted mineral fiber, ASTM E1264 Type III, Form 2, Pattern CE, with the following characteristics:
 - 1. Size: 24 by 24 inches and 24 by 48 inches, as indicated on drawings.
 - 2. Thickness: 3/4 inches.
 - 3. Composition: mineral fiber.
 - 4. NRC: 0.70 min as determined by ASTM C423.
 - a. NRC 0.90 required where indicated on drawings.
 - 5. CAC: 35 min as determined by ASTM C1414.
 - 6. Light Reflectance: 0.84 min as determined by ASTM E1477.
 - 7. Edge: Square.
 - 8. Surface Color: White.

9. Surface Texture: Fine fissured; Non-Directional.
 10. Suspension System: Exposed Steel Suspension System Type A.
- D. Acoustical Panels - Ceiling Type 1.12: Scrubbable painted mineral fiber, ASTM E1264 Type IX, Form 2, Pattern G, with the following characteristics:
1. Size: 24 x 48 inches.
 2. Thickness: 5/8 inches.
 3. Composition: Mineral fiber.
 4. CAC: 35 min as determined by ASTM C1414.
 5. Light Reflectance: 0.79 min as determined by ASTM E1477.
 6. Edge: Square.
 7. Surface Color: White.
 8. Surface Texture: Medium.
 9. Paint: Factory-applied vinyl latex paint.
 10. Suspension System: Exposed Steel Suspension System Type B.
 11. LEED Credit MR 4: Subject to compliance with requirements, provide minimum recycled content of 20% combined.

2.3 SUSPENSION SYSTEM(S)

- A. Manufacturer: Same as for acoustical units.
- B. LEED Credit MR 4: Subject to compliance with requirements, provide minimum recycled content of 25% combined.
- C. LEED Credit MR 5: Subject to compliance with requirements, provide materials that have been extracted, harvested or recovered, and manufactured within 500 miles of Project site.
- D. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- E. Exposed Steel Suspension System Type A: Formed steel, commercial quality cold rolled; heavy-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: White painted.
- F. Exposed Steel Suspension System Type B: Formed steel, commercial quality, hot dipped galvanized steel; heavy-duty.
 1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Steel: Hot dipped galvanized.
 4. Finish: White painted.

2.4 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
 2. At every outside corner bullnose in a CMU wall, provide a bullnose corner cover.

- C. Touch-up Paint: Type and color to match acoustical and grid units.
 - 1. LEED Credit IEQ 4.2: For field applications that are inside the waterproofing system, paints and coatings shall comply with the VOC limits of authorities having jurisdiction and the following:
 - a. Architectural Paints and Coatings: Comply with Green Seal Standard GS-11.
 - b. Comply with the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Omissions from Various Sources Using Small-Scale Environmental Chambers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected ceiling plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.

- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- G. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.4 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 ATTIC STOCK

- A. Provide attic stock equal to 2% of each ceiling type to location indicated by Owner.

END OF SECTION

SECTION 09 6500 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- C. Shop Drawings: Provide plans indicating product, color and texture, floor pattern(s), and direction(s) of material. For sheet flooring, plans should indicate seam locations.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Verification Samples: Submit two full-size samples, or two samples a minimum of 12 by 12 inches, illustrating color, texture and pattern for each resilient flooring product specified.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Materials: Quantity equivalent to 5 percent of each type and color.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area within range recommended by manufacturer(s) but at a temperature no less than 55 degrees F and no more than 90 degrees F.
- D. Do not double stack pallets.

1.6 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Vinyl Composition Tile (VCT): Homogeneous, with color extending throughout thickness.
 - 1. Base Bid
 - 2. Manufacturers:
 - a. Armstrong World Industries, Inc: www.armstrong.com/#sle.
 - b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - c. Mannington Mills, Inc: www.mannington.com/#sle.
 - 3. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
 - 4. Size: 12 by 12 inch or as indicated on drawings.
 - 5. Thickness: 0.125 inch.
 - 6. Pattern: As indicated on drawings.
 - 7. Color: As indicated on drawings.
- B. Luxurt Vinyl Tile (LVT): Printed film type, with transparent or translucent wear layer.
 - 1. Add Alternate No. 4.
 - 2. Products:
 - a. Structure as manufactured by Mannington Mills, Inc.; www.manningtoncommercial.com
 - b. SPRK as manufactured by AVA Commercial Luxury Vinyl Flooring, a Novalis company; www.avaflor.com
 - c. Matuto PLus as manufactured by Mohawk Carpet, LLC; www.mohawkgroup.com
 - 3. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 4. Square Tile Size: As indicated on drawings.
 - 5. Plank Tile Size: As indicated on drawings.
 - 6. Wear Layer Thickness: 0.040 inch.

7. Total Thickness: 0.125 inch.
8. Pattern: As indicated on drawings..
9. Color: As indicated on drawings.

C. Sustainable Design Requirements

1. Provide industry-wide or product-specific EPD. Include EPD Summary.
2. For flooring provide Material Ingredient Report.
3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

2.2 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.

1. Manufacturers:
 - a. Burke Flooring: www.burkeflooring.com/#sle.
 - b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - c. Roppe Corp: www.roppe.com/#sle.
2. Height: 4 inch.
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Length: Roll.
6. Color: To be selected by Architect from manufacturer's full range.
7. Accessories: Premolded external corners, internal corners, and end stops.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

1. VOC Content Limits: As specified in Section 01 6116.

C. Floor Polish for VCT Flooring: Fluid-applied high-performance, hydrophobic, diamond-infused, urethane finish.

1. Basis of Design Product: Armstrong World Industries Diamond 10 Technology Coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

1. Test in accordance with ASTM F710.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints and butt seams tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.5 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.8 ATTIC STOCK

- A. Provide attic stock equal to 2% of each flooring color and base to location indicated by Owner.

END OF SECTION

SECTION 09 6566 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rubber sheet flooring, adhesively installed.
- B. Painted game lines.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- C. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements.
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- D. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.
- E. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.
- F. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
- G. Test Reports: Submit test reports showing compliance with DIN EN 14904.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

PART 2 PRODUCTS

2.1 PREFORMED ATHLETIC FLOORING

- A. Manufacturers/Products: All products by the same manufacturer.
 - 1. Mondo Sport & Flooring Vulcanized Advance; www.mondoworldwide.com
 - 2. Connor Flooring PowerDek; www.connorsports.com
 - 3. Robbins Sports Surfaces Galazy Ultra; _____: www.robbinsfloor.com/#sle.
- B. Rubber Sheet Flooring: Rubber athletic flooring for adhered installation.
 - 1. Rubber wear layer and rubber shock-absorbant layer vulcanized together.
 - 2. Thickness: 8mm
 - 3. Sheet Width: Minimum 48 inches.
 - 4. Tensile Strength: Minimum 150 psi, per ASTM D412.
- C. Sustainable Design Requirements
 - 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. Provide Material Ingredient Report.
 - 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

2.2 ACCESSORIES

- A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

3.2 PREPARATION

- A. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

- B. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Comply with manufacturer's recommendations.

3.4 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.5 PROTECTION

- A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6616 - PRECAST EPOXY TERRAZZO TILE

PART 1 GENERAL

1.1 SUMMARY

- A. Types of Precast Epoxy Terrazzo work included:
 - 1. Precast Epoxy Terrazzo Stairs
 - 2. Precast Epoxy Terrazzo Tiles
 - 3. Precast Epoxy Terrazzo Base
- B. Setting material, grouts, sealants and caulks
- C. Installation of precast epoxy terrazzo stairs, base, sills, etc.
- D. Related work not specified under this section
 - 1. Installation of steel stairs to receive precast epoxy terrazzo

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C-150
 - 2. ASTM C-33
 - 3. ASTM C-140
 - 4. ASTM C-293
 - 5. ASTM C-1028
- B. National Terrazzo and Mosaic Association Inc. (NTMA)
- C. Federal Register Part III
 - 1. 28 CFR Part 36

1.3 SUBMITTALS

- A. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- B. Shop Drawings
 - 1. Submit shop drawings of all precast epoxy terrazzo items showing detail sections and profile for all precast items. Details shall show all reinforcing and special hardware for fastening.
- C. Samples:
 - 1. Submit maximum of 3 samples 6" x 6" size for all color.
 - a. Color to be selected from Wausau Tile color pallet.
 - 2. Submit two copies of NTMA maintenance literature.

- 3. Quality Assurance and Procedure Program
- D. Performance Requirements:
 - 1. Compressive Strength 10,000 p.s.i.
 - 2. Flexural Strength 3,000 p.s.i.
- E. Certification:
 - 1. Suppliers shall furnish certification attesting that materials meet specification requirements.

1.4 QUALITY ASSURANCE

- A. NTMA Standards: Comply with specified provisions and recommendations of the National Terrazzo & Mosaic Association, Inc. (NTMA).
- B. Manufacturer's Instructions: In addition to specified requirements, comply with precast terrazzo manufacturer's instructions and recommendations for substrate preparation, materials storage, mixing and application, finishing and curing.
- C. Qualifications: Precast Terrazzo Manufacturer and Trade Contractor must have a minimum of 5 years of successful experience on projects of similar magnitude and Complexity to that indicated project. Manufacturer and contractor to be prequalified by Architect prior to bidding. Failure to prequalify will void bid.
- D. Manufacturer to supply a written Quality Assurance Program and Procedure manual.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packaging and Shipping: Precast terrazzo to be palletized and shrink wrapped, delivered in original unopened packaging with legible manufacturer identification, including size, piece number, quantities, manufacturer date and inspector initials.
- B. Storage and Protection: Precast terrazzo to be stored indoors, in a climate controlled environment, sheltered from moisture in original packaging. Protect from damage by other trades.
- C. Report all damage due to shipment immediately. Customer is required to sign the Bill of Lading slip noting damaged product. Picture proof is required.

1.6 WARRANTY

- A. Manufacturer/Installer shall warrant installed system for a period of 1 year from date of substantial completion against failure of workmanship and materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Wausau Tile, Inc. (Basis-of-Design)
 - 2. Concord Terazzco Company, Inc.
 - 3. Sustainable Construction Systems, Inc.

- B. Clarification Note: Drawings and specifications are based on manufacturer's proprietary literature from Wausau Tile, Inc. Other manufacturer's shall comply with minimum levels of material specifications and detailing indicated on the drawings of specified herein.

2.2 MATERIALS

- A. Epoxy Resin
- B. Aggregates: All aggregates to meet ASTM C-33 specifications, cleaned and properly graded to size. Aggregate shall be blended to meet individual project requirements.
- C. Marble chips, size to conform with NTMA gradation standards.
- D. Abrasive Inserts: Shall consist of silicon carbide and black epoxy. Specify one to three lines.
- E. Caulks & Sealants:
 - 1. Urethane or Polyurethane Sealant
 - 2. Color to be selected by Architect from standard color pallet.
- F. Cleaner: Liquid neutral chemical cleaner, with pH factor between 7 and 8, of formulation recommended by sealer manufacture for type of precast terrazzo used and complying with NTMA requirements.
- G. Sealer: Colorless, slip and stain-resistant penetrating sealer with pH factor between 7 and 8, that does not affect color or physical properties of precast terrazzo surface. Flash point (ASTM D56): 80 degrees F, Minimum.
- H. Sustainable Design Requirements:
 - 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. Provide Material Ingredient Report.
 - 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

2.3 MANUFACTURED UNITS

- A. Sizing Tolerances:
 - 1. All units to conform to shop drawings with a 1/16" tolerance in dimension.
- B. Precast Surfaces and Edges:
 - 1. All exposed edges to be ground and polished with a minimum of 1/16" bevel.
 - 2. All finished surfaces to be ground and polished, free of holes and to have overall uniformity in matrix and aggregate.
 - 3. All precast epoxy terrazzo finished surfaces to be sealed with a sealer approved by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas to receive precast epoxy terrazzo for the following:
 - 1. Defects in existing work.
 - 2. Deviations beyond allowable tolerances for the substrate.

- B. Start work only when all defects have been corrected by others.

3.2 INSTALLATION

A. Setting:

1. Setting methods will vary per product. Set accurately as shown on the approved shop drawings. Contact your setting material manufacturer with any questions on proper bonding of all materials.
Setting methods are:
 - a. Cement based setting materials: Contact your selected manufacturer as recommended or specified. Setting materials can change without notice.
 - b. Epoxy based setting materials: Contact your selected manufacturer as recommended or specified. Setting materials can change without notice.
 - c. Weld attachment: Contact Wausau Tile for recommended welding guidelines as provided by the structural engineer. DO NOT run a continuous weld when attaching terrazzo to avoid over-heating and cracking of the terrazzo.
 - d. Bolt attachment: Only use bolt-in option if weld attachment cannot be used. Do not over-tighten bolts to avoid cracking of the terrazzo.
2. All thinset materials, whether cement or epoxy based, will require a full setting bed be applied to all appropriate surfaces of the precast terrazzo, vertical and horizontal, where contact is made with the substrate or structural base.
3. Alignment of precast should be straight and true to all dimensions. It may not vary more than 1/8" in length, height or width.
4. Install anchors as shown on details, if required.
5. Fill joints between with manufacturer -approved caulk or as specified.

B. Protection:

1. Upon completion, the work shall be ready for final inspection and acceptance by owner or owner agent.
2. General Contractor shall protect the finished work from the time the terrazzo contractor completes the work.

- C. Finish: All precast epoxy terrazzo finished surfaces to be sealed with a sealer approved by manufacturer.

END OF SECTION

SECTION 09 6623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy matrix terrazzo with ground and polished finish.
- B. Divider strips.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- D. NTMA (COLOR) - Terrazzo Color Palettes.
- E. NTMA (GRAD) - Aggregate Gradation Standards.
- F. NTMA (EPOXY) - Epoxy Terrazzo Specifications.

1.3 SUBMITTALS

- A. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.
- D. Samples: Submit two samples, 12 inch by 12 inch in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.
- E. Installer's Qualification Statement.
- F. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.
- G. LEED Submittal: Documentation of recycled content and location of manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by matrix manufacturer.
 - 3. Contractor member of the National Terrazzo and Mosaic Association, Inc.

1.5 MOCK-UP

- A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 3 by 3 feet.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store terrazzo materials in a dry, secure area.
- B. Maintain minimum temperature of 60 degrees F.
- C. Keep products away from fire or open flame.

1.7 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

PART 2 PRODUCTS

2.1 EPOXY MATRIX TERRAZZO APPLICATIONS (ADD ALTERNATE NO. 3)

- A. Floors:
 - 1. Thickness: 3/8 inch, nominal.
 - 2. Color(s): To be selected by Architect.
 - 3. Aggregate Type: Marble chips.
 - 4. Aggregate Size: No. 2.
- B. Wall Base:
 - 1. Thickness: Same as floors.
 - 2. Style: Coved.
 - 3. Color(s): Same as adjacent floor.
 - 4. Aggregate Type and Size: Same as floors.
- C. Stairs - Treads, Risers, and Landings:

1. Thickness: Same as floors.
2. Color(s): Same as adjacent floor.
3. Aggregate Type and Size: Same as floors.

2.2 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
- D. Finishing Grout: Epoxy, color to match terrazzo matrix.
- E. Sustainable Design Requirements:
 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 2. Provide Material Ingredient Report.
 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

2.3 ACCESSORIES

- A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.
- E. Primer: _____.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

- D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture vapor emission, internal relative humidity, and alkalinity; obtain instructions if test results are not within limits recommended by terrazzo materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by mechanically abrading surface in accordance with manufacturer's instructions.
- C. Prepare concrete surfaces according to ICRI 310.2R, _____.
- D. Apply primer in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install control joint strips straight and flat to locations indicated.
- B. Install divider strips according to pattern approved on shop drawings.
- C. Place terrazzo mix over substrate to thickness indicated.

3.4 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.
- C. Apply grout to fill voids exposed from grinding.
- D. Remove grout coat by grinding, using a fine grit abrasive.

3.5 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.

3.6 CLEANING

- A. Immediately after terrazzo has dried, apply sealer in accordance with manufacturer's instructions.
 - 1. Apply minimum two coats when flooring is dried.
 - 2. Apply additional three coats at Project Substantial Completion.
- B. Contractor to polish surfaces in accordance with manufacturer's instructions.

3.7 PROTECTION

- A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

3.8 ATTIC STOCK

- A. Provide minimum 5 gallons of terrazzo floor sealer to location indicated by Owner.

END OF SECTION

SECTION 09 6700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied flooring and base.

1.2 REFERENCE STANDARDS

- A. ANSI/ESD STM7.1 - Standard Test Method for the Protection of Electrostatic Discharge Susceptible Items - Floor Materials - Resistive Characterization of Materials.
- B. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- C. Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section.
- B. Supervisor Qualifications: Trained by product manufacturer, under direct full time supervision of manufacturer's own foreman.

1.5 MOCK UP

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 - 1. Number of Mock-Ups to be Prepared: One.
 - 2. Use same materials and methods for use in the work.
 - 3. Locate where directed.
 - 4. Minimum Size: 48 inches by 48 inches.
- B. Obtain approval of mock-up by Architect before proceeding with work.

- C. Approved mock-up may remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 FIELD CONDITIONS

- A. 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.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring: Polyurethane base coat(s) with broadcast aggregate.
 - 1. Aggregate: Quartz granules.
 - 2. System Thickness: 1/8 inch, nominal, when dry.
 - 3. Texture: Slip resistant.
 - 4. Sheen: High gloss.
 - 5. Color: As selected by Architect.
 - 6. Products:
 - a. Key Resin Company; Key Urecon SLT System : www.keyresin.com/#sle.
 - b. Sika Corporation; Sikafloor PurCem Self-Leveling Broadcast System: www.sikafloorusa.com/#sle.
 - c. Crossfield Products Corp: Dex-O-Tex Decor-Flor.
- B. Sustainable Design Requirements:
 - 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. Provide Material Ingredient Report.
 - 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.

2.2 ACCESSORIES

- A. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- B. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Prepare concrete surfaces according to ICRI 310.2R.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

- A. Install cant strips at base of walls where flooring is to be extended up wall as base.

3.4 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness indicated.
- C. Finish to smooth level surface.

3.5 FIELD QUALITY CONTROL

- A. Test installed floor surface in accordance with ANSI/ESD STM7.1 .

3.6 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.

END OF SECTION

SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Textile composite flooring modules fully adhered.

1.2 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute.
- C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For flooring provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For flooring provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For flooring: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum ____ years experience.

1.5 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design; Product J+J Flooring Group; Kinetex: www.jjflooringgroup.com .
- B. Other Acceptable Manufacturers:
 - 1. Tandus: www.tandus.com.
 - 2. Interface, Inc: www.interfaceinc.com/#sle.
 - 3. Substitutions must meet minimum requirements of Basis-of-Design..

2.2 MATERIALS

- A. Sustainable Design Requirements:
 - 1. Provide Industry-wide or product-specific EPD. Include EPD Summary.
 - 2. Provide Material Ingredient Report.
 - 3. Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVOC range or GREENGUARD Gold certification.
- B. Kinetex floor modules : Fusion bonded,
 - 1. Product: Flash, Pop, Accelerate, Increase, Boom manufactured by J+J Flooring Gtroup.
 - 2. Tile Size: 24 x 24 inch, nominal.
 - 3. Location: As indicated on Drawings. inch
 - 4. Color: As selected by Architect from Manufacturer's full range..
 - 5. Pattern: Refer to drawings..
 - 6. Primary Backing Material: Poylester Felt Cushion.

2.3 ACCESSORIES

- A. Edge Strips: 3/16" aluminum. , color as selected from manufacturer's full range.
- B. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.
- C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

2.4 MAINTENANCE EQUIPMENT

- A. Within 30 days following the completion of installation, the flooring installer or Contractor shall schedule and provide an in-house maintenance demonstration to the Owner to be given by the Manufacturer.
- B. A standard Maintenance Package system shall be furnished to the Owner as part of the tile carpet Purchase Order for use by the Owner for post-installation operation and maintenance.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet 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 carpet tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines, as required by floor pattern indicated in drawings.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

3.5 ATTIC STOCK

- A. Provide 5% of each color/pattern.

END OF SECTION

SECTION 09 7200 - PRESENTATION DRY ERASE WALLCOVERING

PART 1 GENERAL

1.1 SUMMARY

- A. Division Includes:
 - 1. Magnetic Receptive Dry Erase Wallcovering.
 - 2. Adhesive Backed Dry Erase Wallcovering.
 - 3. Tray, Trim, and Presentation Rails.
 - 4. Accessories.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
- B. Test Method for Surface Burning Characteristics of Building Materials.
- C. Gypsum Association
- D. GA-214-M-97 Recommended Levels of Gypsum Board Finish.

1.3 SUBMITTALS

- A. Manufacturer's product data and installation instructions for each type of dry erase wallcovering, adhesive, and accessories required.
- B. Manufacturer's written product data indicating compliance with specified materials required.
- C. Manufacturer's written installation instructions.
- D. Manufacturer's written instructions for recommended maintenance of each type of dry erase wall covering required.
- E. Samples:
 - 1. 7 inch (177.8mm) x 9 inch (228.6mm) samples of each dry erase material required.
 - 2. 6 inch (152.4mm) samples of trim, tray, and end caps required.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of dry erase wallcovering required produced by one manufacturer.
- B. Installer: Installation by skilled commercial wallcovering contractor with no less than three years of documented experience installing dry erase wallcovering of the types and extent required.
- C. Composition:
 - 1. Mag-Rite 48: Provide scrim backed, ferrous powder vinyl bonded with white pigmented vinyl and capped with moderate gloss, dry erase film.
- D. Surface Burning Characteristics Classification: Provide materials that meet Class I/A rating when tested in accordance with ASTM E84 for flame spread and smoke developed

- E. Field Samples: Prepare field samples for architect's review and establish requirements for seaming and finish trim.
 - 1. Install sample panel of each type presentation wallcovering specified in area designated by architect.
 - 2. Maintain corrected and approved samples to serve as a standard of performance for the project.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver presentation wallcoverings to the project site in unbroken and undamaged original factory packaging and clearly labeled with the manufacturer's identification label, quality or grade, and lot number.
- B. Store materials in a clean, dry storage area with temperature maintained above 55°F (13°C) with normal humidity.
- C. Store material within original packaging to prevent damage.

1.6 PROJECT CONDITIONS

- A. Do not apply presentation wallcoverings when surface and ambient temperatures are outside the temperature ranges required by the wallcovering manufacturer.
- B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 55°F (13°C) unless required otherwise by manufacturer's instructions.
- C. Apply adhesive when substrate surface temperature and ambient temperature is above 55°F (13°C) and relative humidity is below forty percent.
- D. Maintain constant recommended temperature and humidity for at least 72 hours prior to and throughout the installation period, and for 72 hours after wallcovering installation completion.
- E. Provide not less than 80-foot-candles per square foot lighting level measured mid-height at substrate surfaces.

1.7 WARRANTY

- A. Submit manufacturer's limited five-year written warranty against manufacturing defects.

1.8 MAINTENANCE

- A. Maintenance instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: Walltalkers Wallcoverings manufactured by Koroseal Interior Products, LLC., Fairlawn, Ohio.
- B. Alternate Manufacturer: MDC Dry Erase Wallcoverings manufactured by MDC Wallcoverings, Glendale Heights, Illinois.

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Blue Heron Elementary School

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**PRESENTATION DRY ERASE
WALLCOVERING**
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- C. Alternate Manufacturer: Transcribed Dry Erase Wallcoverings manufactured by Ventress, Inc, Simpsonville, SC.

2.2 MATERIALS

- A. Basis of Design Product - Walltalkers Mag-Rite 48: Magnetic receptive, low gloss, vinyl surface for dry erase markers.
- B. Products by Alternate Manufacturers shall meet minimum requirements of Basis of Design Product.

2.3 TRIM

- A. Aluminum Trim: Clear satin, anodized aluminum, snap-on trim with clips.
- B. J Cap Wallcovering Trim:
 - 1. JC12-00: Clear satin, anodized aluminum, low profile trim
- C. Plastic Marker Dispenser:
 - 1. PMD1-92: Gray plastic marker dispenser.

2.4 ACCESSORIES

- A. Adhesives: Heavy-duty clear or clay based premixed vinyl adhesive.
- B. Substrate Primer/Sealer: White pigmented acrylic base primer/sealer specifically formulated for use with vinyl wallcoverings.
- C. Presentation Starter Kit: Provide one Walltalkers starter kit containing eight dry erase markers, one eraser, two dry erase cleaning cloths, one empty bottle for water, and one 8 ounce (.23kg) bottle liquid surface cleaning solution for each room installed with dry erase wallcovering.
 - 1. RK1RSK2: Regular starter kit with standard dry erase markers.
- D. Broad Tip Dry Erase Markers:
 - 1. EC12-99: Chisel BLK - 12CT
 - 2. EC04-00: Set of four colors: red, blue, green, black.
- E. Eraser:
 - 1. DEFE-99: Dry erase felt eraser.
 - 2. DECC-Y1: Dry erase cleaning cloth - yellow.
- F. Magnets:
 - 1. MAG1: Heavy duty magnet - black (12 per) .

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and installation conditions to ensure surface conditions meet or exceed a Level 5 finish, per GA-214-M-97: Recommended Levels of Gypsum Board Finish, and permanent lighting should be installed and operational.

- B. Test substrate with suitable moisture meter and verify that moisture content does not exceed four percent.
- C. Verify substrate surface is clean, dry, smooth, structurally sound, and free from surface defects and imperfections that would show through the finished surface.
- D. Evaluate all painted surfaces for the possibility of pigment bleed-through.
- E. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.
- F. Beginning of installation means acceptance of surface conditions.

3.2 INSTALLATION WALLCOVERING BACKING.

- A. Acclimate wallcovering in the area of installation a minimum of 24 hours before installation.
- B. Read and follow the manufacturer's installation instruction sheet contained in each roll of the dry erase wallcovering.
- C. Examine all materials for pattern, color, quantity and quality, as specified for the correct location prior to cutting.
- D. Primer: Use a quality pigmented acrylic wallcovering primer.
- E. Adhesive: Apply a uniform coat of heavy-duty pre-mixed clay-based or extra strength clear wallcovering adhesive.
- F. Install each strip horizontally and in the same sequence as cut from the roll.
- G. Install dry erase wallcovering sheets in exact order as they are cut from bolt. Reverse hang alternate strips (except lined products). Do not crease or bend the wallcovering when handling.
- H. Install dry erase wallcovering horizontally using a level line.
- I. Using a level or straight edge, double cut the seam with a seam-cutting tool (Ex: Double Seam-Cutter or Swedish Knife). Do not score drywall or plasterboard when cutting material.
- J. When covering the entire wall, seam the material out of the main writing and viewing areas of the wall.
- K. Apply wallcovering to the substrate using a wallcovering smoother, wrapped with a soft cloth, to remove air bubbles. Do not use sharp edged smoothing tools. Smooth material on the wall from the middle to the outside edge.
- L. Remove excess adhesive immediately after the wallcovering is applied. Clean entire surface with a warm mild soap solution, and clean soft cloths. Rinse thoroughly with water and let dry before using. Change water often to maintain water clarity.
- M. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

3.3 INSTALLATION SELF-ADHESIVE BACKING.

- A. Apply Walltalkers adhesive backed dry erase wallcovering only on surfaces impervious to moisture such as chalkboards, marker boards, glass, high-pressure laminates, or similar.
- B. Acclimate wallcovering in the area of installation a minimum of twenty-four hours before installation.
- C. Examine all materials for color, quantity, and quality as specified for the correct location prior to cutting.
- D. Read and follow the instructions in the manufacturer's installation sheet contained in each roll of the dry erase wallcovering.
- E. Do not crease or bend the wallcovering when handling.
- F. Mix dampening solution by using one half to one capful of mild detergent to 1 gallon (1.81kg) clean water. Dampening solution is used in positioning the material and allows for the removal of air bubbles.
- G. Use a pump spray bottle to apply the dampening solution to the the surface.
- H. Slowly remove release liner and smooth wall covering to the hanging surface using a wallcovering smoother wrapped with a soft cloth from the middle to the outside edge to remove air bubbles.
- I. Stop installation of material that is questionable in appearance and notify the manufacturer's representative for an inspection.

3.4 CLEAN-UP

- A. Upon completion of installation, remove all exposed adhesive immediately using a soft cloth and a warm, mild soap solution and rinse thoroughly with water and dry with clean towel prior to using.
- B. Upon completion of the work, remove surplus materials, rubbish, and debris resulting from the wallcovering installation. Leave areas in neat, clean, and orderly condition.

END OF SECTION

SECTION 09 8311 - ACOUSTICAL WALL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Prefabricated, acoustical wall panel system.
- B. Accessories as required for complete installation.

1.2 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E2573 - Standard Practice for Specimen Preparation and Mounting of Site-Fabricated Stretch Systems to Assess Surface Burning Characteristics.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Specimen warranty.
 - 5. Manufacturer's recommendation for painting product.
- B. Shop Drawings: Elevations indicating proposed locations of fabric seams and details indicating typical transitions to other finish surfaces.
- C. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. LEED Submittals:
 - 1. Product Certificated for Credit MR 4: For products with a recycled content such that the sum of postconsumer recycled content plus 1/2 of the preconsumer content constitutes at least 20%, based on cost, of the total value of the materials in the project.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide all components of acoustical wall systems by a single manufacturer, including recommended primers, adhesives, and sealants.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical panels from excessive moisture in shipment, storage, and handling. Do not deliver materials to project until wet work such as concrete and plaster has been completed

- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Do not begin installation until interior conditions have reached temperature and humidity that will be maintained during occupancy. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Correct defective Work within a 5-year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustical Wall System Panels:
 - 1. Basis of Design: Tectum Finale Acoustic Wall Panel .
 - a. Alternate Product/Manufacturer: Acoustical Surfaces Envirocoustic Wood Wool
 - b. Alternate Product/Manufacturer: Baux Acoustic Panels

2.2 ACOUSTICAL WALL SYSTEM

- A. Acoustical Wall System: Site-installed on furring strips and insulation between the wall and the panels; designed to be removed independent of adjacent panels.
 - 1. Surface Burning Characteristics: Flame Spread Index of 25, maximum; Smoke Developed Index of 450, maximum; when whole system is tested in accordance with ASTM E84 using mounting specified in ASTM E2573.
 - 2. Noise Reduction Coefficient (NRC): 0.80, minimum, when tested in accordance with ASTM C423 Type "C-40" mounting by Tectum.
 - 3. Panel Height: As indicated on the drawings.
 - 4. Panel Width: As indicated on the drawings.
- B. Provide materials and systems made of recycled content, at least 90 percent post-consumer or post-industrial.
- C. Verify that all adhesives and sealants employed in installation of acoustical wall systems are low-emission types, with low VOC ratings.

2.3 MATERIALS

- A. Acoustical Core:
 - 1. Thickness: 1 inch, minimum.
 - 2. Material: Aspen wood fibers bonded with inorganic hydraulic cement.
- B. Fabric: None.
- C. Mounting: "C-40" - Continuous horizontal metal hat shaped furring channels at 24" O.C. vertically with SoniCor fiber core between the panel and wall as Basis of Design or Approved equal.

- D. Finish: Field paint per manufacturer's recommendations. Color to be selected by Architect from manufacturer's full range.
- E. Fasteners: As recommended by manufacturer of acoustical wall system for project conditions.
- F. Adhesives: Low VOC or water-based, approved by wall system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all casework, markerboards, door and window jambs, finished ceiling, and other finished items abutting acoustical wall systems have been installed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove wall plates and other obstacles, and prepare substrates to receive core material in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install acoustical wall systems at locations indicated and in accordance with approved shop drawings, complying with manufacturer's instructions.
- B. Acoustic Panels: All surfaces and edges are to be factory finished. No field cutting is permitted with exception to the following:
 - 1. At fixtures mounted within area of acoustical wall system, install rigid blocking for backing and to maintain fixture surface flush with acoustical panels.
 - 2. Cope acoustic panel tight to building elements such that there is no gap between the acoustic panel and building element in excess of 1/8 inch.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical wall system, complying with manufacturer's instructions for cleaning and repair of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 PROTECTION

- A. Protect installed products until completion of project, using methods that will ensure that the finished work will be without damage or deterioration at Date of Substantial Completion.

END OF SECTION

SECTION 09 8400 - ACOUSTICAL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sound Diffusing Wall Panels.
- B. Convex Wall Sound Diffusing Panels.

1.2 SUBMITTALS

- A. See Section 01 3000 - 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 fabric orientation.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available .
- E. LEED Submittals:
 - 1. Product Certificated for Credit MR 4: For products with a recycled content such that the sum of postconsumer recycled content plus 1/2 of the preconsumer content constitutes at least 20%, based on cost, of the total value of the materials in the project.
 - 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.3 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.

PART 2 PRODUCTS

2.1 CONVEX WALL SOUND DIFFUSING PANEL

- A. Panels: Prefinished, factory assembled thermo molded plastic, fabric-covered panels.
 - 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Panel Dimensions: 24" x 24".
 - 3. Corners: Reinforced with diagonal supports,.
 - 4. Mounting: Back mounting.
 - 5. Fabric Color: As selected by Architect from manufacturer's full range.
 - 6. Products:

- a. Basis of Design Product: Type I Convex Wall Diffuser manufactured by Wenger Corporation.
- b. Alternate Product: Conwed Designscape Respond Wall Diffuser manufactured by Owings Corning
- c. Alternate Product: Kinetics Geometric Diffusers by Kinetics Noise Control

2.2 CONVEX LAY-IN CEILING DIFFUSING PANEL

- A. Panels: Prefinished, factory assembled thermo molded plastic
 - 1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 2. Panel Dimensions: 24" x 48".
 - 3. Corners: Reinforced with diagonal supports.
 - 4. Mounting: Lay-in
 - 5. Color: As selected by Architect from manufacturer's full range.
 - 6. Products:
 - a. Basis of Design Product: Type I Convex Ceiling Diffuser Panel manufactured by Wenger Corporation.
 - b. Alternate Product: Conwed Designscape Respond Ceiling Diffuser manufactured by Owings Corning.
 - c. Alternate Product: Kinetics Geometric Diffusers by Kinetics Noise Control.

2.3 FABRICATION

- A. General: Fabricate panels to sizes and configurations indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
 - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.

2.4 ACCESSORIES

- A. Spline-Mounting Accessories: Manufacturer's standard concealed connecting splines of steel designed for screw attachment to walls, with coordinating moldings and trim for interior and exterior corners and miscellaneous conditions.
- B. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal:

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.
 - 1. Provide a factory finished edge to match panel where cutting is necessary.
- B. Install panels to construction tolerances of plus or minus 1/16 in for the following:
 - 1. Plumb and level.

2. Flatness.

3.3 CLEANING

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- B. Clean exposed surfaces of acoustical panel, trim, moldings and suspension members to comply with manufacturer's instructions for cleaning.
- C. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.4 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 9000 - PAINTING AND COATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Exposed surfaces of steel lintels and ledge angles.
 - 4. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Floors, unless specifically so indicated.
 - 9. Ceramic and other tiles.
 - 10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 11. Glass.
 - 12. Acoustical materials, unless specifically so indicated.
 - 13. Concealed pipes, ducts, and conduits.
- E. **PAINT ALL EXPOSED SURFACES**, whether or not scheduled colors are designated in "schedules", except where natural finish or material is specifically noted as a surface not to be painted. Where suspended ceiling systems such as "clouds" are held away from or do not touch wall surfaces, paint wall color to a minimum of 8 inches above designated ceiling elevation. Remaining wall surfaces extending to underside of structure or deck to be painted same color as above the ceiling items.

1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For paints and coatings provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For paints and coatings provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product
- C. Samples: Submit three paper "drop" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Coatings: 5 percent, but not less than 1 gallon of each color and type; store where directed.
 - 2. Label each container with color in addition to the manufacturer's label.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience.
- C. Source Limitations: Obtain blockfillers and primers for each coating system from the same manufacturer as the finish coats.

1.5 MOCK-UP

- A. Mock-ups: Provide a full-coat finish mock-up for each type of coating and substrate required. Duplicate finish of approved Submittals.

1. Architect will select a maximum of six (6) rooms or surfaces to represent surfaces and conditions for application of each type coating, substrate, and color.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) for each paint type and color selection.
 - b. Small Areas and Items: Architect will designate items or areas required.
2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

B. Provide door and frame assembly illustrating paint coating color, texture, and finish.

C. Mock-up may remain as part of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.

B. Paints:

1. Benjamin Moore & Co: www.benjaminmoore.com/#sle.
2. McCormick Paints: www.mccormickpaints.com.
3. PPG Architectural Finishes, Inc: www.ppgaf.com/#sle.
4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
5. Tnemec, Inc.: www.tnemec.com.

C. Stains:

1. Behr Process Corporation: www.behr.com/#sle.
 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- D. Primer Sealers: Same manufacturer as top coats.
- E. Block Fillers: Same manufacturer as top coats.

2.2 PAINTS AND COATINGS - GENERAL

- A. Sustainable Design Requirements:
1. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.
 2. Provide Material Ingredient Report.
- B. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 2. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 5. Supply each coating material in quantity required to complete entire project's work from a single production run.
 6. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- C. Block Filler, Latex, Interior: MPI #4.
- D. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
1. Primer Sealer, Latex, Interior for CMU: MPI #4.
 2. Primer, Latex, Interior for Gypsum Board and Wood: MPI #50 X-Green.
 3. Metal Primer, Rust-Inhibitive, Water Based: MPI #107.
- E. Water-Base Paints:
1. Latex, Interior, Flat for Ceilings (Gloss Level 1): MPI #53 X-Green.
 2. Latex, Interior, Semi-Gloss for Walls (Gloss Level 4): MPI #43 X-Green.
 3. Catalyzed Epoxy, Interior, Gloss (Gloss Level 6): MPI #115 X-Green.
 4. Acrylic, Interior, Semi-Gloss (Gloss Level 5): MPI #163 X-Green.
 5. Acrylic, Interior, Gloss (Gloss Level 6): MPI #164 X-Green.
- F. Dry Fog/Fall Coatings:
1. Dry Fall, Latex, Flat: MPI #118.
 - a. Sherwin Williams Waterborne Acrylic Dry Fall B42W00081 (39 g/L).
- G. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:

- a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. USGBC LEED Rating System, edition as stated in Section 01 3515; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
- 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- H. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- I. Colors: As indicated on drawings
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - EXTERIOR

- A. See High-Performance Coatings Specification section 09 9600 for painting Architectural Exposed Structural Steel.
- B. Ferrous Metal
 - 1. Alkyd System: MPI EXT 5.1D
 - a. Surfaces to be coated: Exterior handrails, posts, stair rails, gate components, hollow metal doors and frames, steel lintels.
 - b. Preparation: Hand or power tool cleaning to SSPC SP11.
 - c. Prime Coat: MPI #79 Alkyd Anti-Corrosive Metal Primer, BM #M06 Alkyd Metal Primer.
 - d. Intermediate Coat: Exterior Alkyd Enamel matching topcoat.
 - e. Topcoat: MPI #9 Exterior Alkyd Enamel, (gloss level 6) BM #22 Urethane Alkyd Gloss Enamel.

2.4 PAINT SYSTEMS - INTERIOR

- A. Concrete Substrates: Floors that are shown as sealed on Finish Schedule.
 - 1. Water Base Acrylic System:
 - a. Surfaces to be coated: Exposed concrete floors.
 - b. Preparation: Clean and dry, free from oil, dirt and other contaminants.
 - c. 1st Coat: S-W Armorseal Tread-Plex, 100% Acrylic Water Based Floor Coating, B90 Series (<100 g/L).
 - d. 2nd Coat: S-W Armorseal Tread-Plex, 100% Acrylic Water Based Floor Coating, B90 Series (<100 g/L).
- B. CMU Substrates:
 - 1. Latex System:
 - a. Surfaces to be coated: CMU.
 - b. Preparation: Clean and dry, free from oil, dirt and other contaminants.
 - c. Block filler: Latex Block filler. MPI #4 Interior latex block filler.
 - 1) S-W Loxon Block Surfer, A24W00200 (85 g/L).
 - d. Intermediate Coat: Interior latex matching topcoat.
 - e. Topcoat: MPI #43 X-Green Interior latex (gloss level 4) for walls.
 - 1) S-W ProMar 200 Zero VOC Interior Latex Semi-gloss, B31W2651 Series (0 g/L).

- C. Ferrous Metal Substrates:

1. Water Base Epoxy System:
 - a. Surfaces to be coated: All metal components of guardrails and non-aluminum or stainless steel handrails. Railings in Auditorium.
 - b. Preparation: SSPC-SP-6 Commercial blast.
 - c. Prime Coat: MPI #107 Primer, Rust-Inhibitor, Water Based.
 - 1) S-W Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 (<100g/L).
 - d. Intermediate Coat: Interior latex matching topcoat.
 - e. Topcoat: MPI #115 X-Green Water Based Epoxy.
 - 1) S-W Pro Industrial Zero VOC Waterbased Catalyzed Epoxy, Gloss, B73-300 Series (0 g/L).
 2. Institutional Low-Order/VOC Latex System:
 - a. Surfaces to be coated: Exposed structural steel not fire treated, steel joists, acoustical and standard steel deck, duct work, hangers, conduit, sprinkler piping. Stair components including stringers, supports and pans. Hollow metal doors and frames.
 - b. Preparation: Clean, dry. Wipe ductwork with solution to remove film and impurities.
 - c. Prime Coat: Factory or shop primer.
 - d. Intermediate Coat: Interior latex matching topcoat.
 - e. Topcoat: MPI #147 X-Green Institutional Low Odor/VOC Interior Latex, Semi-Gloss (gloss level 5).
 - 1) S-W Pro Industrial Zero VOC Acrylic, Semi-gloss, B66-650 Series (0g/L).
 3. Water-Based Dry-Fall System:
 - a. Surfaces to be coated: Exposed steel, joists, duct work, hangers, piping, supply and RA grilles, at Stage, Music Rooms, Black Box Theater and above Radiused Sound Reflecting Ceiling Panels in the Auditorium.
 - b. Preparation: Clean, dry. Wipe ductwork with solution to remove film and impurities.
 - c. Prime Coat: Factory or shop primer.
 - d. Topcoat: MPI #118 Latex Dry Fog/Fall.
 - 1) Sherwin Williams Waterborne Acrylic Dry Fall, Flat, Black, B42B00081.
- D. Wood Substrates
1. Latex System:
 - a. Surfaces to be coated: Wood Substrates scheduled to receive opaque finish.
 - b. Preparation: Sanded smooth, clean, dry.
 - c. Prime Coat: MPI #50 X-Green Interior Latex Wood Primer.
 - 1) S-W ProMar 200 Zero VOC Primer, B28W2600 (0 g/L).
 - d. Intermediate Coat: Interior latex matching topcoat.
 - e. Topcoat: MPI #153 X-Green Interior Zero VOC Acrylic, Semi-gloss (gloss Level 5).
 - 1) S-W Pro Industrial VOC Acrylic Semi-Gloss, B66-650 Series (0 g/L).
 - f. Topcoat (Wood/Masonite Floor at Stage): MPI #53 X-Green Interior Latex (gloss Level 1).
 - 1) S-W ProMar 200 Zero VOC Interior Latex Flat, Black, B30W02653.
 2. Acrylic Satin Water-Based:
 - a. Surfaces to be coated: Wood Substrates scheduled to receive clear or stain finish.
 - b. Preparation: Sanded smooth, clean, dry.
 - c. Stain: Wood Classics Interior Oil Stain - 250, A49-800 Series (202 g/L).
 - d. Intermediate Coat: Matching topcoat.
 - e. Topcoat:
 - 1) Wood Classics Waterborne Polyurethane Varnish, Gloss - A68 Series (311 g/L).
- E. Gypsum Board Substrates
1. Latex System:
 - a. Surfaces to be coated: Interior gypsum wall board walls, ceiling and bulkheads.
 - b. Preparation: Properly prepared Level 4 GWB finish.

- c. Prime Coat: MPI #50 X-Green Interior latex primer/sealer. (For use on new, unpainted surfaces.)
 - 1) S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (0 g/l).
- d. Intermediate Coat: Interior latex matching topcoat.
- e. Topcoat: MPI #53 X-Green Interior latex (gloss level 1) for ceiling and bulkheads.
 - 1) S-W ProMar 200 Zero VOC Interior Latex Flat, B30W2650 Series (0 g/l).
- f. Topcoat: MPI #54 X-Green Interior latex (gloss level 5) for walls.
 - 1) S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W2651 Series (0 g/l).

2.5 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete 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.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- M. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- N. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. High performance coatings.
- B. Surface preparation.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating coating materials .
- C. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements:
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For paints and coatings provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For paints and coatings provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.
- D. Samples: Submit two samples 2 x 2 inch in size illustrating colors available for selection.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and locations where used.

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 FIELD CONDITIONS

- A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

- C. Restrict traffic from area where coating is being applied or is curing.

1.6 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. High-Performance Coatings:
 - 1. Tnemec: www.tnemec.com. Basis of Design.
 - 2. Carboline Company: www.carboline.com.
 - 3. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 4. Sika Corporation; Sikagard Hygiene Urethane Wall System: www.sikafloorusa.com/#sle.

2.2 HIGH-PERFORMANCE COATINGS

- A. Sustainable Design Requirements:
 - 1. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.
 - 2. Provide Material Ingredient Report.
- B. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.
 - 2. Scrubbability: Excellent

2.3 MATERIALS

- A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
- B. Urethane Exterior Steel Primer Coating For Column, Base Plate and Exposed Portions of Anchor Bolts and Nuts: One coat, two-part, aliphatic moisture-curing polyurethane, eggshell finish.
 - 1. Product characteristics:
 - a. Percentage of solids by volume: 63, minimum.
 - b. Dry film thickness, per coat: 2.5 to 3.5, minimum.
 - 2. Product: Tneme-Zinc, Series 90-97 manufactured by Tnemec.
- C. Polyurethane Exterior Steel Coating For Columns, Plates and Bolts, Etc. Above Pavement: Two coats, two-part, polyurethane, non-skid finish .
 - 1. Product characteristics:
 - a. Percentage of solids by volume: 58, minimum.
 - b. Dry film thickness, per coat: 2 to 5 mils, minimum.
 - 2. Product: Endura-Shield III, Series 73 manufactured by Tnemec.

- D. Polyurethane Exterior Steel Coating 1'-0" and Below Pavement: Two coats, two part polyurethane finish.
 - 1. Product characteristics:
 - a. Percentage of solids by volume: 67, minimum.
 - b. Dry film thickness, per coat: 2 to 10 mils, minimum.
 - 2. Product: Hi-Build Expoxoline II, Series N69 manufactured by Tnemec.
 - 3. Primer for steel: As recommended by manufacturer for specific installation.
- E. Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.
- F. Shellac: Pure, white type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.
- F. Masonry: Verify masonry joints are struck flush.
- G. Wood: Do not begin application if substrate has moisture content over 12 percent.

3.2 PREPARATION

- A. Clean surfaces of loose foreign matter.
- B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- C. Remove finish hardware, fixture covers, and accessories and store.
- D. Existing Painted and Sealed Surfaces:
 - 1. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.
- E. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.3 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.
- C. Concrete Masonry: Apply masonry filler to thickness required to fill holes and produce smooth surface; minimum thickness of 30 mils.

3.4 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

- A. Protect finished work from damage.

3.7 SCHEDULE

- A. Colors: As selected from manufacturer's full range.
- B. Architectural Exposed Structural Steel:
 - 1. All exterior steel exposed including but not limited to: Steel at exterior canopies, steel roof ladders, steel roof hand railings/guards.

END OF SECTION

SECTION 09 9672 - FLUID APPLIED INSULATION COATING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. Section includes a spray-applied insulative coating including primer, insulative coating and topcoat for the following applications:
 - 1. Applied to steel penetrating the exterior envelope, from 18 inches (minimum) outboard of the face of the wall to 18 inches (minimum) inside the face of metal framing; Refer to drawings.

1.2 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual.
- B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- 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. ASTM D4585 - Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
- G. ASTM D5894 - Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet).
- H. ASTM D870 - Standard Practice for Testing Water Resistance of Coatings Using Water Immersion.
- I. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- L. ISO 20340 - Paints and Varnishes.
- M. SSPC-SP 6 - Commercial Blast Cleaning.
- N. UL 263 - Standard for Fire Tests of Building Construction and Materials.

1.3 SYSTEM DESCRIPTION

- A. The liquid applied thermal break acrylic material shall be applied at the required thickness specified by the manufacturer in order to mitigate thermal bridging. In no case shall the K- value of the liquid applied thermal break be more than 0.040 W/mK.

1.4 SUBMITTALS

- A. Product Data: Submit product data including manufacturers technical data indicating product performance characteristics, performance and limitation criteria.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 1. MR Credit 2: BPDO - Environmental Product Declarations
 - a. For paints and coatings provide Product-specific declaration or Industry-wide EPD or product-specific EPD. Include EPD Summary.
 - 2. MR Credit 4: BPDO - Material Ingredients
 - a. For paints and coatings provide Material Ingredient Report.
 - 3. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.
- C. Manufacturer's Instructions: Submit manufacturer written installation instructions.
- D. Applicator Qualifications: Submit applicators current certification as a manufacturer trained applicator.

1.5 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Company specializing in manufacturing product in this section with a minimum of 2 years documented experience in manufacturing insulative technology.
 - a. Applicator: Company specializing in applying the work of this section with documented experience and trained by the manufacturer.
 - b. Fluid Applied Thermal Break Acrylic system shall be the complete system from a sole source consisting of primer, acrylic thermal break material and topcoat. All materials shall be LEED 2009 compliant.
- B. Mock-up:
 - 1. Minimum thirty days prior to application in any area, provide mock-up Samples of thermal break materials in accordance with the following requirements:
 - a. Provide minimum two square feet on representative substrate, where directed by the Engineer, for each different thickness and finish of required for the work.
 - b. Provide mock-up areas that comply with thickness, density application, finish texture, and color.
 - c. Inspect mock-up areas within one hour of application for variance due to shrinkage, temperature, and humidity.
 - d. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary to meet required installation, finish, and color requirements.
 - e. Continue to provide mock-up areas until acceptable areas are produced.
 - f. Acceptable areas shall constitute standard of acceptance for method of application, thickness, finish texture, and color requirements, for fluid applied thermal break material applications.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in manufacturers' original, sealed, undamaged container with identification label intact. Packaged materials shall bear the appropriate labels, seals.

- B. Storage: Materials shall be stored in strict accordance with manufacturers documented instructions.
 - 1. Documentation: All batch number, product identification and quantities shall be recorded on appropriate QC documents. A copy of the transport document and manufacturers conformance certificate shall be attached to the material delivery on site.

1.7 PROJECT/SITE CONDITIONS

- A. Project Environmental Requirements: Substrate and air temperature shall be in accordance with the manufacturers' requirements.
 - 1. Protect work area from windblown dust and rain. Protect adjacent areas from over spray of material.
 - 2. Provide ventilation in areas to receive work of this section during application and minimum 24 hours after application.
- B. Temperature and Humidity Requirements: Maintain air temperature and relative humidity in areas where products will be applied for a time period before during and after application as recommended by manufacturer.
 - 1. Do not apply Fluid Applied Acrylic Thermal Break when temperature of substrate and/or surrounding ambient air temperature is below 45° F. Temporary protection and heat shall be maintained at this minimum temperature for 24 hours before, during and 24 hours after material application.
 - 2. Steel substrate temperature shall be a minimum of 5° F (3° C) above the dew point of the surrounding air for a period of 24 hours prior, during the application of the material and 24 hour cure period.
 - 3. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.
 - 4. The relative humidity of the application area shall not exceed a maximum of 85% 24 hours prior, during and 24 hours after the application of the material. The relative
 - 5. humidity shall not exceed 75% throughout the application and curing of the decorative top coat finish.

1.8 WARRANTY

- A. Provide manufacturer's standard 2 year warranty and applicators workmanship 2 year warranty.

PART 2 PRODUCTS

2.1 FLUID APPLIED INSULATION COATING GENERAL

- A. Materials Compatibility:
 - 1. Provide shop and field primers, and finish-coat materials that are compatible with one another and with the 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. Sustainable Design Requirements:
 - 1. For interior wet-applied paints and coatings: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2017 indicating TVC range and VOC content in g/L. Include volume of material applied per product.
 - 2. Provide Material Ingredient Report.

2.2 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
 - 1. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Insulation Coating:
 - 1. Tnemec Company Incorporated, www.tnemec.com.
 - 2. Sherwin-Williams Company, www.sherwin-williams.com.
 - 3. Carboline Company, www.carboline.com

2.3 PRIMER

- A. Mio-Zinc Filled Aromatic Polyurethane:
 - 1. VOC Content: 246 grams/liter
 - 2. Color: 0250 Greenish-Gray
 - 3. Requirements:
 - a. Adhesion to Steel (ASTM D4541): No less than 1,150 psi.
 - b. Fire Testing (UL 263, ASTM E119): Any UL Classified spray-applied fire resistive materials having a maximum average density of 19.5 pcf. Including W.R. Grace Monokote MK-6/HY and Isolatek (Cafco) Blaze-Shield II (Type II).
 - c. Salt Fog Corrosion (ASTM B117): No cracking or delamination of film. No more than 1/64" rust creepage at scribe and no more than 3% rusting on plane after 10,250 hours exposure.
 - d. Slip Coefficient & Tension Creep: Meets AISC (MAN) requirements of a Class B surface with a mean slip coefficient no less than 0.57.
 - e. CDPH Compliant: Passes the California Department of Public Health (CAL (CDPH SM)) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1-2010.

2.4 THERMAL INSULATING COATING

- A. Fluid Applied Acrylic Insulation Coating
 - 1. VOC Content: 1.9 grams/liter
 - 2. Solids by Volume: 76 percent.
 - 3. Colors: 1278 Insulation Yellow
 - 4. Requirements:
 - a. Abrasion (ASTM D4060): No more than 50.2 mg loss after 1,000 cycles.
 - b. Cyclic Salt Fog/UV Exposure (ASTM D5894): No blistering, cracking, rusting or delamination of film after 5,000 hours.
 - c. Humidity Resistance (ASTM D4585): No blistering, cracking, rusting, or delamination after 2,000 hours.
 - d. Immersion (ASTM D870): No blistering, cracking, rusting, or delamination after six months continuous tap water immersion.
 - e. Surface Burning Characteristics (ASTM E84): Class A
 - f. Thermal Conductivity (ASTM C518): No greater than 0.0356 W/in-°K or 0.2468 BTU-in/ft²-hr-°F.
 - g. NORSOK M-501 ISO 20340: Passed 25 cycles.
 - h. CDPH Compliant: Passes the California Department of Public Health (CAL (CDPH SM)) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1-2010.

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. All surfaces to receive the specified thermal insulating coating shall follow the manufacturer's printed instructions and be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other foreign substances which would impair bond of the material to the substrate.
- D. Other corrections of the surfaces to receive the Fluid Applied Insulation Coating material shall be the responsibility of the Contractor, at no additional cost to the Owner.
- E. Application of the primer and thermal insulating coating shall not commence until the contractor, applicator and inspector have examined the surfaces to receive the primer and determined the surfaces are acceptable to receive the primer and thermal insulating coating. Commencement of application means acceptance of substrate.
- F. Verify that substrate and workspace temperature and humidity conditions are in accordance with manufacturers recommendations.

3.2 SURFACE PREPARATION

- A. Prepare surfaces in accordance with manufacturer's instructions.
- B. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be coated with thermal break coating.
- C. Weld spatter and defects shall be ground smooth prior to commencement of primer and fluid applied thermal break material.
- D. Primer shall not be applied to prepared substrate until the area has been adequately vented to remove all airborne dust. Prior to the application of any coating material, the blast products, dust and debris shall be removed by vacuuming.
- E. Steel Substrates: Remove rust and loose mill scale.
 - 1. Fabrication defects:
 - a. Correct steel and fabrication defects revealed by surface preparation.
 - b. Remove weld spatter and slag.
 - c. Round sharp edges and corners of welds to a smooth contour.
 - d. Smooth weld undercuts and recesses.
 - e. Grind down porous welds to pinhole-free metal.
 - f. Remove weld flux from surface.
 - 2. Ensure surfaces are dry.
 - 3. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.

- F. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
 - 1. Shop Primer: Prepare shop primer to receive field coat in accordance with manufacturer's instructions.

3.3 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
 - 1. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
 - 2. Keep containers closed when not in use to avoid contamination.
 - 3. Do not use mixed coatings beyond pot life limits.
 - 4. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- B. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- C. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- D. Apply primer at thickness recommended by manufacturer.
- E. Apply Thermal Insulative Coating as specified in Section 3.8 Coating Schedule.
- F. Apply topcoat at thickness recommended by the manufacturer.
- G. Final Dry Film Thickness (DFT) shall be measured with a dry film thickness gauge.
- H. The steel deck is not to be sprayed unless otherwise indicated.

3.4 REPAIR

- A. Materials and Surfaces Not Scheduled to Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: All patching and repair to material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage. Patching shall be performed by applicators certified by the manufacturer and applied in accordance with the manufacturer application instructions.
- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.5 FIELD QUALITY CONTROL

- A. The Installer will engage an independent testing laboratory to inspect and verify the application of material in accordance with the provisions of manufacturer.
 - 1. Material inspection and testing shall be performed 24 hours after completion of final application coat.
 - 2. The results of the above tests shall be made available to all parties at the completion of each pre-designated area and approval.

3. In-place material not in compliance with the specified thickness requirements shall be corrected prior to final acceptance.
- B. The dry film thickness (DFT) of the applied material shall be measured with a non-destructive coating thickness gage after material has completely cured. All measurements shall be documented in writing and furnished to the Owner.
- C. Manufacturer's Technical Services: Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.

3.6 CLEANING AND PROTECTION

- A. Remove overspray materials from surfaces not required to be thermally protected.
- B. Protect surfaces of coating systems from damage during construction.
- C. Touch-up, or repair damaged products before Substantial Completion.

3.7 HANDLING OF THERMAL INSULATIVE COATING (REFER TO SECTION 05 1200 STRUCTURAL STEEL FRAMING)

3.8 FLUID APPLIED INSULATION COATING SCHEDULE

- A. Steel Members Penetrating Exterior Building Envelope/Inside Face of Metal Framing:
 1. Fluid Applied Thermal Break System, Mio-Zinc MCU Primer: (Refer to Section 05 1200 Structural Steel Framing)
 - a. Shop Surface Preparation: SSPC-SP 6/NACE 3
 - b. Prime Coat (Shop Applied) Series 394-0250 PerimePrime, DFT of 2.5 to 3.5 mils per coat.
 - c. Intermediate Coat (Shop Applied) - Two Coats: Series 971 Aerolon Acrylic, DFT of 40.0 to 50.0 mils per coat. Total thickness of Series 971: 80 to 100 mils.

END OF SECTION

SECTION 10 1101 - VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Markerboards and Tackboards.
- B. Visual Display Rails
- C. Support systems for visual display boards.

1.2 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- C. Samples: Submit color charts for selection of color and texture of markerboard, tackboard, tackboard surface covering, and trim.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 WARRANTY

- A. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Visual Display Boards:
 - 1. Claridge Products and Equipment, Inc; ____: www.claridgeproducts.com/#sle.
 - 2. Polyvision Corporation (Nelson Adams); ____: www.polyvision.com/#sle.
 - 3. ADP Lemco, Inc.: www.adplemco.com.

2.2 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Steel Face Sheet Thickness: 24 gage, 0.0239 inch .

2. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 3. Backing: Aluminum foil, laminated to core.
 4. Size: As indicated on drawings.
 5. Frame: Extruded aluminum, with concealed fasteners.
 6. Frame Finish: Anodized or Baked enamel, as selected by Architect from manufacturer's full range.
 7. Accessories: Provide chalk tray and map rail.
- B. Tackboards: Composition cork.
1. Cork Thickness: 1/8 inch.
 2. Color: As selected from manufacturer's full range.
 3. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 5. Size: As indicated on drawings.
 6. Frame: Same type and finish as for markerboard.
 7. Frame Finish: Anodized or Baked enamel, as selected by Architect from manufacturer's full range..
 8. Accessories: Provide map rail.
- 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 similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
 2. Configuration: As indicated on drawings.
 3. Units Too Large to Ship Assembled: Fully assembled in factory, then disassembled for shipping.

2.3 MATERIALS

- A. Porcelain Enamelled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

2.4 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board. Provide (2) for each room.
- E. Visual Display Rail: Advantus Grip-A-Strip Display Rail or equivalent.
- F. Mounting Brackets: Concealed.

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.

3.3 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1200 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nonilluminated bulletin board cabinets.
 - 2. Illuminated display cases.
 - 3. Custom glass display case doors and concealed hardware.

1.2 DEFINITIONS

- A. Bulletin Board: Tackable visual display surface or tackboard enclosed in a display case.
- B. Display Case: Glazed cabinet with adjustable shelves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.4: For composite wood products used in display cases, documentation indicating that product contains no urea formaldehyde.
 - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 3. Product Certificated for Credit MR 4: For products with a recycled content such that the sum of postconsumer recycled content plus 1/2 of the preconsumer content constitutes at least 20%, based on cost, of the total value of the materials in the project.
 - 4. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show location of seams and joints in visual display surfaces.
 - 2. Include sections of typical trim members.
 - 3. Wiring Diagrams: For power, signal, and control wiring.
- D. Samples for Initial Selection: For units with factory-applied color finishes, and as follows:
 - 1. Actual sections of visual display surfaces.
 - 2. Section of header panel for color selection.
- E. Samples for Verification: For each type of product indicated.
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- (152-mm-) long sections of each trim profile.

- F. Delegated-Design Submittal: For glass display case doors, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display surfaces, operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain display cases from single source from single manufacturer (does not include glass display case doors).
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.
- C. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
- D. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- E. Vinyl Fabric: FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.
- F. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.

- G. Aluminum Tubing: ASTM B 429, Alloy 6063.
- H. 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.
- I. 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.
- J. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 NONILLUMINATED BULLETIN BOARD CABINET _____

- A. Manufacturers:
 - 1. ADP Lemco, Inc.
 - 2. Claridge Products and Equipment, Inc.
 - 3. PolyVision Corporation; a Steelcase company.
- B. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard assembly on back inside surface and operable glazed doors at front.
- C. Aluminum-Framed Cabinet: Extruded aluminum; with baked-enamel finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
- D. Cabinet Corners: Square.
- E. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
 - 1. Thickness: Not less than 6 mm thick.
 - 2. Number of Doors: Two.
- F. Tack Surface: Natural-cork tackboard assembly .
- G. Width: As indicated on Drawings.
- H. Height: As indicated on Drawings.
- I. Depth: 3 inches (76 mm).
- J. Mounting Height: As indicated on Drawings.
- K. Mounting: Surface mounted.

2.3 DISPLAY CASE

- A. Manufacturers:
 - 1. ADP Lemco, Inc.
 - 2. Claridge Products and Equipment, Inc.
 - 3. PolyVision Corporation; a Steelcase company.

- B. Recessed Cabinet: Factory-fabricated cabinet; with tackboard assembly on back inside surface, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Cabinet Box: Plywood with low-pressure simulated wood grain laminate.
 - 2. Cabinet Frame and Trim: Aluminum.
 - 3. Aluminum Finish: Baked enamel.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
 - 1. Thickness: Not less than 6 mm thick.
 - 2. Number of Doors: Two, Three and Four (as indicated on Drawings).
- D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.
 - 1. Shelf Width: 10" Deep at 12" Deep Cabinets and 12" Deep at 18" Deep Cabinets.
 - 2. Number of Shelves: Three.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.
- F. Tack Surface: Natural-cork tackboard assembly .
- G. Integral Lighting: Concealed top-lighting system consisting of Luma Vue LED Tube Lighting. 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.

2.4 FABRICATION

- A. Fabricate 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.

2.5 GENERAL FINISH REQUIREMENTS

- 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: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for bulletin boards.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Bulletin Boards: Attach units to wall surfaces with concealed fasteners through back of cabinet.
- C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.
- D. Comply with requirements specified elsewhere for connecting illuminated bulletin boards.
 - 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 so 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 1400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plaques.
 - 2. Dimensional characters.
 - 3. Panel signs.
 - 4. Graphics.

1.2 DEFINITIONS

- A. ADA Accessibility Guidelines: U.S. Architectural Access Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines, Latest Version."

1.3 REQUIREMENTS

- A. General:
 - 1. Compliant with applicable codes and ADA Accessibility Guidelines. Advise the Architect of any conflicts between any design or installation requirements and code/ADA Accessibility requirements.
 - 2. Type Styles:
 - a. Must be upper case, sans serif.
 - b. Proportion: Width of the uppercase letter "O" is 55 percent minimum and 110 percent maximum of the height of the uppercase letter "I".
 - c. Stroke thickness of the uppercase letter "I" must be 15 percent maximum of the height of the character.
 - 3. Tactile and Braille Characters: Characters raised a minimum of 1/32 inch and accompanied by Grade 2 braille.
 - 4. Character Height: Tactile characters must be between 5/8 inch and 2 inches in height.
 - 5. Pictograms/Symbols:
 - a. Minimum of 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. Provide pictogram and descriptive verbiage.
 - 6. Finish and Contrast:
 - a. Matte/non-glare characters and background: min. contrast of 70%.
 - b. Light characters on dark background or dark characters on light background are acceptable.
 - 7. Mounting:
 - a. Mounting to be per 703.4 of the ADA Guidelines. Any discrepancies to be reviewed in the field with the Architect.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layout of each sign type, cast letters, and plaques. Indicate dimensions, characters, pictograms and Braille, mounting type and height, materials and finish.

- C. Signage Schedule/Message List: Provide Excel spreadsheet with sufficient information to define each sign for fabrication, including room number, room name, other text or graphics to be applied, any accessories or other qualifying information.
 - 1. When room names and numbers on the signs differ from those on the drawings, include the drawing room name and number on the schedule.
 - 2. Submit preliminary schedule for review with Owner at least two months prior to start of fabrication.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Aluminum.
 - 2. Acrylic sheet.
 - 3. Vinyl.
- E. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
 - 1. Cast Letters: Piece/portion of actual cast letter.
 - 2. Panel signs: Actual sign, size of typical room sign, one with inserts and one without.
 - 3. Vinyl: Minimum 4"x4" piece in color(s) selected.
- F. Maintenance Data: For signs to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer. Maintain this temperature during and after installation of signs.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs, and in-place construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. 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.
- B. Cast/Extruded Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing). Homogenous color (color consistent through thickness of material).

2.2 PLAQUES

- 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. Gemini Incorporated.
 - 2. Metal Arts; Div. of L&H Mfg. Co.
- B. Cast Plaque: Provide castings free of pits, scale, sand holes, and other defects, as follows:
 - 1. Plaque Material: Bronze
 - 2. Background Texture: Pebble with satin finish.
 - 3. Border Style: Double-raised line border, polished.
 - 4. Text: Arial, raised text, polished.
 - 5. Mounting: Concealed studs, non-corroding for substrates encountered.
 - 6. Size: 36"w x 24"h

2.3 DIMENSIONAL CHARACTERS

- 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. Gemini Incorporated.
 - 2. Metal Arts; Div. of L&H Mfg. Co.
- B. 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. Material: Aluminum.
 - 2. Height: As noted on Drawings.
 - 3. Thickness: Manufacturer's standard thickness for height of characters shown on Drawings.
 - 4. Font: Futura Bold
 - 5. Finish: Baked Enamel
 - 6. Color(s): As selected by Architect from manufacturer's full range.
 - 7. Mounting: Projected Spacer Mounting. Concealed studs, non-corroding for substrates encountered. 1/4" projection from wall surface.
- C. Plate-Cut Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Alloy and temper recommended by sign manufacturer for process used and for use and finish indicated. Comply with the following requirements.
 - 1. Material: Aluminum.
 - 2. Height: As noted on Drawings.

3. Thickness: 1/8"
4. Font: Furura Bold
5. Finish: Baked Enamel
6. Color(s): As selected by Architect from manufacturer's full range. Multiple colors may be selected.
7. Mounting: Flush Mounting. Concealed studs, non-corroding for substrates encountered.
8. No sharp edges.

D. Dimensional Character Sign Schedule:

1. As noted on the Drawings, except as noted below:
 - a. Letters on the exterior of the building and site sign (both sides).
 - 1) School Name: BLUE HERON ELEMENTARY SCHOOL
 - 2) Address: 7100 EAGLE HEAD DRIVE

2.4 PANEL SIGNS FOR ROOM/GENERAL SIGNAGE

- A. 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. ASI.
 2. Best Sign Systems Inc.
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:
1. Cast/Extruded Acrylic Sheet: 1/8" inch thick, smooth finish.
 2. Edge Condition: Square.
 3. Corner Condition: Square.
 4. Size: Minimum 6" x 8". Final size TBD based on text.
 5. Mounting: Unframed.
 - a. Interior: Wall mounted with two-face tape.
 - b. Exterior: Manufacturer's standard anchors for substrates encountered.
 6. Color: As selected by Architect from manufacturer's full range.
 7. Tactile Characters/Symbols: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
 8. Changeable Message Inserts: Fabricate signs to allow for two (2) changeable inserts. Provide clear plastic insert to allow for insertion of thick paper behind.
 - a. Provide changeable inserts for all panel signs except stairs, toilet rooms, storage rooms, mechanical rooms, electrical rooms, janitor closets and directional signs.
 9. For signs mounted on glass: Provide an acrylic back plate same size as sign for mounting on opposite side of glass.
 10. Toilet Room signs to contain male or female (or both) symbol and international symbol of accessibility along with associated text and Braille.
 11. Stair signs to contain stair symbol along with associated text and Braille.
- C. Exterior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
- D. Panel Sign Schedule:
1. Provide one sign for every opening (whether there is a door or not).
 2. Provide interior panel signs, as follows, at each opening:
 - a. Corridor side: Per Part 2.4, Paragraph B.

- b. Room side: Door/Opening number only.
- 3. Provide exterior panel signs, as follows, at each opening:
 - a. Exit Number as indicated on Egress Plans (drawings CS.4 and CS.5).
- 4. Provide additional signs, with message text to be provided by the Owner, as follows:
 - a. Provide 10 additional room signs. Location TBD.
 - b. Provide 15 directional signs with text, Braille and arrows.
 - c. Provide all signage required by, and whose characteristics are fully in compliance with, all applicable code requirements including requirements for tactile signage, at locations and of types including but not limited to:
 - 1) Panel signs indicating Maximum Occupancy in all Assembly areas.
 - (a) Locations: At all spaces with occupancy limits indicated on sheet CS.3 through CS.5..
 - (b) Panel signs in stairwells at each floor level, indicating the terminus of the top and bottom of the stair enclosure, and the identification of the stair. State the story of, and the direction to the exit discharge, and the availability of roof access from the stairway for the fire department.
 - (1) Locate 3 feet above the floor landing in a position that is readily visible when the doors are in the open and closed positions.
 - (c) Directional panel signs indicating the nearest accessible route shall be provided at the following locations, and shall include the international symbol of accessibility at the following locations:
 - (1) Inaccessible building entrances (exterior).
 - (2) At all floor landings of all elevators.
 - (d) Panel sign stating EXIT shall be provided adjacent to each door to an egress stairway, an exit passageway and the exit discharge.
 - (1) Message text: EXIT
 - (e) Provide signs at all toilet rooms.
 - (1) Message Content: Indicating female or male.
 - (2) Message symbol: Stylized symbol indicating female or male.
 - (3) Message symbol: International symbol of accessibility.

2.5 PRINTED GRAPHIC PANELS

- A. Basis-of-Design: Construction Specialties Acrovyn by Design; www.c-sgroup.com.
- B. Materials
 - 1. Engineered PETG High-Impact Rigid Sheet
 - a. Nominal .040" (1.02mm) thick rigid sheet supplied in 4' x 8' or 10' (1.2m x 2.4m or 3.0m) sheet sizes in standard Suede texture.
 - b. High definition graphic file, as indicated on drawings, reverse printed on clear sheet and sealed with protective backer.
 - 1) Graphic files shall be provided by Architect.
 - c.
 - 2. Trim: Aluminum alloy 6063 T5 with clear or colored anodized finish; minimum strength and durability properties as specified in ASTM B221
- C. Finishes
 - 1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applications and designations of finishes.
- D. Accessories
 - 1. Adhesive: Printed graphic panels shall be furnished as a complete packaged system, including appropriate standard adhesive.

2.6 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.7 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 - 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 - 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.8 FINISHES, GENERAL

- 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.

2.9 ALUMINUM FINISHES

- A. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

2.10 CAFETERIA SIGNAGE

- A. FCPS Standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
- B. See Drawings for mounting height information. Comply with all applicable codes for mounting height.
- C. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
- D. 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.
- E. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
 - 1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 10 1453 – TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Requirements of the General Provisions apply to all work under this section.
- B. Frederick County Division of Utilities and Solid Waste Management – general conditions and specifications for water mains, sanitary sewer and related structures dated January 1, 2015 and as amended.
- C. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Architect for consideration. Those judged to be equal to that specified will receive written approval.

1.2 SUMMARY

- A. Furnish all labor, materials, equipment and services necessary for and reasonably incidental to complete the site signs work as indicated on drawings or specified, including but not limited to the following:
 - 1. Exterior Parking Signs
 - 2. Exterior Traffic Control Signs.

1.3 QUALITY ASSURANCE

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.
- B. All signage to comply with A.D.A. requirements.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.
- B. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacture and design of each sign component, including graphics.
 - 1. Submit full-size sample units, if requested by Architect. Acceptable units may be installed as part of the work.
- C. Shop Drawings: Submit shop drawings for fabrications and erection of specialty signs. Include plans, elevations and large scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Andco Industries Corp.
- B. A.C. Davenport & Son Co.
- C. A.S.I. Sign Systems
- D. Spanjer Brothers, Inc.
- E. The Supersine Company
- F. Southwell Company

2.2 GENERAL REQUIREMENTS

- A. All letters shall be Helvetica Medium; upper case.
- B. Letters shall be centered on signs.
- C. Panel backgrounds shall be colored from manufacturer's standards with matte finish.

2.3 MATERIALS

- A. Aluminum Casting: Alloy and temper recommended by aluminum producer or finisher for typed of use and finish indicated and with not less than the strength and durability properties specified in ASTM B 221 for 6063 TS

2.4 EXTERIOR PARKING SIGNS

- A. Type: Silk screened letters and symbol on 0.125" dark blue baked enamel color aluminum message panel, supported on 1-1/2" square steel post set in concrete footing.

2.5 EXTERIOR TRAFFIC CONTROL SIGNS

- A. All signs shall be in accordance with the "Manual on Uniform Traffic Control Devices for Streets and Highways". Revision Number 2, dated March, 1986 and as amended.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install sign units and components at locations indicated on the drawings securely mounted with concealed theft resistant fasteners, unless otherwise indicated. Attach signs to substrates in accordance with manufacturer's instructions.
- B. Install sign units level, plumb and at proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair and replace damaged units as directed by Architect.

C. Installation of Exterior Parking and Traffic Control Signs:

1. Erect sign plumb with top as indicated on the drawings.
2. Anchor to concrete footing with concealed anchors in accordance with manufacturer's recommendations.

3.2 CLEANING AND PROTECTION

- A. At completion of installation, clean soiled sign surface in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

END OF SECTION

SECTION 10 1500 - VIDEO DISPLAY SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Panelized LED video display systems.

1.2 REFERENCE STANDARDS

- A. ANSI/Infocomm 10 - Audiovisual Systems Performance Verification.
- B. UL 879 - Electric Sign Components.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting two weeks prior to the start of the work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's data sheets on panelized LED display systems including recommendations for preparation, storage and handling, and installation.
- B. Shop Drawings: Indicate cable routing, connections between equipment, anchor and support details, and adjacent construction.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. System Setting Backup: Provide an electronic file of all system settings.
- E. Security Items:
 - 1. Provide one set of keys for each locked equipment enclosure.
 - 2. Provide passwords to access control functions for hardware and software user interfaces.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Authorized Manufacturer Representative: System shall be configured and commissioned by an authorized manufacturer representative.

1.6 DELIVERY, STORAGE, AND HANDLING

1.7 WARRANTY

- A. Provide six year manufacturer warranty for system.

1.8 SUBSCRIPTION

- A. Provide lifetime subscription service from date of initial purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. WatchFire Signs, LLC: www.watchfiresigns.com
 - 1. Basis-of-Design
- B. Barco, Inc.: www.barco.com/#sle.
- C. LG Electronics: www.lg.com/us/business/#sle.

2.2 PANELIZED LED VIDEO DISPLAY

- A. Performance Requirements:
 - 1. Comply with performance standards based on tests conducted in accordance with ANSI/Infocomm 10.
- B. System Type: Flat, Double-Faced.
 - 1. Pixel Pitch: 19.05mm True Pixel, 1R or 1A
 - 2. Horizontal Viewing Angle: 170 degrees (plus/minus 85 degrees off center).
 - 3. Vertical Viewing Angle: 160 degrees (plus/minus 80 degrees off center).
 - 4. Mount Type: Custom mount in masonry assembly; Refer to drawings..
 - 5. Location: Outdoor.
 - 6. Panel Height: 32 inches.
 - 7. Panel Length: 80 inches.
 - 8. Color: Brigh Red or Bold Amber
 - 9. Video Fram Rate: 30 frames/second

2.3 CONTROLS

- A. Interface Unit:
 - 1. Working Voltage: 120 VAC / 240 VAC at 60Hz.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates and support structure is in place and properly prepared.
- B. Verify that required power and data sources are provided.
- C. Verify that space is available for centrally located components.

3.2 PREPARATION

- A. Do not proceed with installation until support structure and substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions .
- B. Install message center and signs level and plumb with fasteners recommended by the manufacturer.

3.4 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation and maintenance of equipment to Owner's designated representative.
- B. Review service and support contacts.

3.5 PROTECTION

END OF SECTION

SECTION 10 2113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.4 SUBMITTALS

- A. Product Data: Provide data on panel construction, hardware, and accessories.
- B. LEED Submittals: Comply with Section 01 3329 - Sustainable Design Requirements
 - 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.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. All American Metal Corp - AAMCO; _____: www.allamericanmetal.com/#sle.
 - 2. Scranton Products (Santana/Comtec/Capital); _____: www.scrantonproducts.com/#sle.
 - 3. Global Partitions.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Sustainable Design Requirements:
 - 1. Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

- B. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Doors:
 - a. Thickness: 1 inch.
 - b. Width: 24 inch.
 - c. Width for Handicapped Use: 36 inch, out-swinging.
 - d. Height: 55 inch.
 - 2. Panels:
 - a. Thickness: 1 inch.
 - b. Height: 55 inch.
 - 3. Pilasters:
 - a. Thickness: 1 inch.
 - b. Width: As required to fit space; minimum 3 inch.
 - 4. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets.

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
- E. Hinges: Stainless steel, manufacturer's standard finish.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2123 - CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface mounted overhead curtain track and guides.
- B. Cubicle curtains.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.3 SUBMITTALS

- A. Product Data: Provide data for curtain fabric characteristics.
- B. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Curtains: Two of each type and size.
 - 2. Extra Carriers: Ten.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept curtain materials on site and inspect for damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cubicle Track and Curtains:
 - 1. A. R. Nelson Co; ____: www.arnelson.com/#sle.
 - 2. C/S General Cubicle; ____: www.c-sgroup.com/cubicle-track-curtains/#sle.
 - 3. Imperial Fastener Co., Inc; ____: www.imperialfastener.com/#sle.

2.2 TRACKS AND TRACK COMPONENTS

- A. Tracks: Extruded aluminum sections; one piece per track run.
 - 1. Profile: Channel.
 - 2. Mounting: Surface.
 - 3. Track End Stop: To fit track section.
 - 4. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
 - 5. Finish on Exposed Surfaces: Clear anodized.
- B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.

- C. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.3 CURTAINS

- A. Cubicle Curtains:
 - 1. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.
 - 2. Color/Pattern: As selected by Architect from Manufacturer's full range..
 - 3. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, manufacturer's standard color.
 - 4. Attachment of Curtain Fabric to Open Mesh Cloth: Manufacturer's standard sewn seam.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.
- 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 curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 2213 - WIRE MESH PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wire mesh systems for stairways.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
- E. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.
- F. 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.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.3 SUBMITTALS

- A. Product Data: Provide data for mesh materials, finishes.
- B. Shop Drawings: Indicate plan and vertical dimensions, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.
 - 1. Show field measurements on shop drawings.
- C. Samples: Submit two 2, 12 by 12 inch in size, illustrating mesh material. Submit samples of hinge and latchset illustrating style, color, and finish. Incorporate sample into the work.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
 - 1. Member firm of the Woven Wire Products Association (WWPA).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wire Mesh Partitions:
 - 1. Acorn Wire and Iron Works, Inc: www.acornwire.com/#sle.

2. The G-S Company: www.g-sco.com/#sle.
3. Miller Wire Works, Inc: www.millerwireworks.com/#sle.

2.2 WIRE MESH PARTITIONS

- A. Wire Mesh Partitions: Factory-fabricated modular assemblies of panels, doors, anchors, and accessories as required to provide a complete system.
 1. Design Criteria:
 - a. Design partition system to provide for movement of components without damage, undue stress on fasteners or other detrimental effects, when subject to design loads.
 - b. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.3 COMPONENTS

- A. Woven Wire Mesh: Standard duty.
 1. Material: ASTM A510/A510M uncoated crimped steel wire.
 2. Wire Size: 10 gage, 0.135 inch.
 3. Mesh Size: 1-1/2 inch diamond shape.
 4. Mesh Weave: Plain weave, inter-crimped.
- B. Framing and Support Members:
 1. Material: ASTM A36/A36M steel shapes and ASTM A500/A500M cold-formed steel.
 2. Framing, Corner Posts, and Intermediate Support Members: Manufacturer's standard sizes for system specified and as indicated on drawings.
 3. Vertical Stiffeners: As required for partitions greater than 144 inches in height.
- C. Doors: Same material as partitions, fully framed; manufacturer's standard construction for swing operation.

2.4 FASTENERS

- A. Bolts, Nuts and Washers: Hot dip galvanized.
- B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

2.5 ACCESSORIES

- A. Bracing: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.
- B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.
- C. Post Caps: Manufacturer's standard.
- D. Floor and Ceiling Pilaster Shoe: Manufacturer's standard.
- E. Floor Base: Manufacturer's standard.

2.6 HARDWARE

- A. Provide Manufacturer's standard, including cylinder locks to match Owner's standard keying system.

2.7 FABRICATION

- A. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- B. Make exposed joints flush or tight.

2.8 FINISHES

- A. Field Painted Finish: As specified in Section 09 9000; Shop primed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that substrate surfaces and required openings are ready to receive work.

3.2 PREPARATION

- A. Clean substrate surfaces.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install items plumb and level, accurately fitted, free from distortion or defects.

3.4 TOLERANCES

- A. Maximum Variation From Plumb or Level: 1/4 inch.

3.5 ADJUSTING

- A. Adjust doors to achieve free movement.

END OF SECTION

SECTION 10 2239 - FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Top-supported folding panel partitions, horizontal opening.
- B. Acoustic operable panel partition.

1.2 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- E. ASTM E413 - Classification for Rating Sound Insulation.
- F. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.
- G. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1. Require attendance by representatives of installer.

1.4 SUBMITTALS

- A. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
- B. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.
- D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
- E. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

F. Manufacturer's Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.7 WARRANTY

A. Correct defective Work within five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:

1. Hufcor, Inc; Series 600: www.hufcor.com/#sle.
2. Moderco, Inc; Signature 8500: www.moderco.com/#sle.
3. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.

2.2 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Center opening; paired panels; side stacking; manually operated.

B. Panel Construction:

1. Frame: 14 gage, 0.0747 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction.
2. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
3. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system; pull bars.
4. Panel Properties:
 - a. Thickness With Finish: 4 inches.
 - b. Width: Standard width.

C. Panel Finishes:

1. Facing: Vinyl coated fabric.
2. Exposed Metal Trim: Not allowed.

D. Panel Seals:

1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:

1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

- F. Performance:
 - 1. Acoustic Performance:
 - a. Sound Transmission Class (STC): 48 to 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
 - 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 - 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Accessories:
 - 1. Pocket Enclosures: Door, frame, and trim to match adjacent walls.
 - 2. Acoustic Sealant: As recommended by partition manufacturer.

2.3 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Vinyl Coated Fabric: ASTM F793/F793M, Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- 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 E557.
- B. Fit and align partition assembly and pocket doors level and plumb.
- C. Lubricate moving components.
- D. Install acoustic sealant to achieve required acoustic performance.
- E. Coordinate electrical connections.

3.3 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.4 CLEANING

- A. Clean finish surfaces and partition accessories.

3.5 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Diaper changing stations.
- D. Utility room accessories.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.4 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- B. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories: Refer to specific items below.
- B. Diaper Changing Stations:
 - 1. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation; _____: www.bradleycorp.com/#sle.
 - 3. Diaper Deck & Company; _____: www.diaperdeck.com/#sle.
 - 4. Koala Kare Products; _____: www.koalabear.com/#sle.
- C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 4 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel.
 - 1. Products:
 - a. Response Universal Jumbo Bath Tissue Dispenser: Model JTT TWIN DISP; www.npscorp.com.
 - b. Substitutions not allowed. .
- B. Paper Towel Dispenser: Roll paper type.
 - 1. Cover: Stainless steel.
 - 2. Paper Discharge: Manual.
 - 3. Capacity: 7.5-8 inch diameter roll.

4. Mounting: Surface mounted.
5. Products:
 - a. Dispensing Dynamics, International: Model HF106-35; www.DispensingDynamics.com.
 - b. Merfin; Model 51031B; www.npscorp.com
- C. Soap Dispenser: Owner furnished, Contractor installed.
- D. Hand Sanitizer Dispenser: Owner furnished, Contractor installed.
- E. Grab Bars: Stainless steel, smooth surface.
 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.
- F. Combination Sanitary Napkin/Tampon Dispenser: Stainless steel, surface-mounted.
 1. Door: Seamless 0.05 inch door with returned edges and tumbler lock.
 2. Cabinet: Fully welded, 0.03 inch thick sheet.
 3. Operation: No charge; no coin slots.
 4. Identify dispensers slots without using brand names.
 5. Minimum capacity: 15 napkins and 20 tampons.

2.5 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
- B. Shower Curtain:
 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 2. Size: 36 by 72 inches, hemmed edges.
 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 4. Color: As selected from manufacturer's standard colors.
 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
 2. Size: ADA Standards compliant.
- D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
- E. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
 1. Length: 18 inches.

- F. Towel Pin: Stainless steel, 3 inch extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.6 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface.
 - 3. Color: As selected by Architect from Manufacturer's full range..
 - 4. Minimum Rated Load: 250 pounds.

2.7 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 - 4. Length: 36 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- B. FM (AG) - FM Approval Guide.
- C. NFPA 10 - Standard for Portable Fire Extinguishers.
- D. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, and anchorage details.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.4 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
 - 3. Nystrom, Inc; _____: www.nystrom.com/#sle.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Ansul, a Tyco Business; _____: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp; _____: www.kidde.com/#sle.
 - 3. Nystrom, Inc; _____: www.nystrom.com/#sle.

2.2 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Temperature range: Minus 40 degrees F to ____ degrees F.

2.3 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Fire Rated Cabinet Construction: One-hour fire rated.
- C. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat rolled edge, with 2 inch wide face.
 - 3. Projected Trim: Returned to wall surface, with 2 1/2 inch projection, and 2 inch wide face.
- D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
- E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- G. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
- H. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install cabinets plumb and level in wall openings, _____ inches from finished floor to inside bottom of cabinet.

END OF SECTION

SECTION 10 5113 - METAL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal lockers.
- B. Locker benches.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- B. Shop Drawings: Indicate locker plan layout, numbering plan.
- C. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Lockers:
 - 1. Art Metal Products: www.artmetalproducts.com/#sle.
 - 2. Lockers MFG: www.lockersmfg.com/#sle.
 - 3. Penco Products, Inc; ____: www.pencoproducts.com/#sle.

2.2 LOCKER APPLICATIONS

- A. Student Lockers: Metal lockers, wall mounted for base indicated on drawings.
 - 1. Width: 12 inches.
 - 2. Depth: 12 inches.
 - 3. Height: 60 inches.
 - 4. Configuration: Single tier.
 - 5. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Hooks: One double prong.
 - 6. Ventilation: Louvers at top and bottom of door panel.
 - 7. Locking: Handle finger lift; Molded, sound-deadening, attached with rivet, padlock eye for use with 9/32 inch diameter padlock schackle.
 - 8. Provide sloped top.

- B. Staff Lockers: Metal lockers, wall mounted for base indicated on drawings.
 - 1. Width: 12 inch.
 - 2. Depth: 12 inches.
 - 3. Height: 72 inches.
 - 4. Configuration: Single tier.
 - 5. Fittings: Size and configuration as indicated on drawings.
 - a. Upper shelf.
 - b. Hooks: One double prong.
 - c. Single shoe shelf.
 - 6. Ventilation: Louvers at top and bottom of door panel..
 - 7. Locking: Handle finger lift; Molded, sound-deadening, attached with rivet, padlock eye for use with 9/32 inch diameter padlock schackle.
 - 8. Provide sloped top.
- C. Locker Benches: Stationary type; bench top of laminated birch; painted steel pedestals.

2.3 METAL LOCKERS

- A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 - 1. Color: To be selected by Architect.
- B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
 - 1. Body and Shelves: 24 gage, 0.0239 inch.
- C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 - 1. Door Frame: 16 gage, 0.0598 inch, minimum.
- D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
 - 1. Door Outer Face: 18 gage, 0.0478 inch, minimum.
 - 2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
 - 3. Form recess for operating handle and locking device.
- E. Hinges: Heavy duty, 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.
- F. Sloped Top: 20 gage, 0.0359 inch, with closed ends.
- G. Coat Hooks: Stainless steel or zinc-plated steel.
- H. Number Plates: Provide oval shaped aluminum plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install fittings if not factory installed.
- H. Replace components that do not operate smoothly.

3.3 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 5613 - METAL STORAGE SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Four post shelving.
- B. Shelving accessories.

1.2 REFERENCE STANDARDS

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

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
- B. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
- C. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.6 WARRANTY

- A. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Four Post Shelving:
 - 1. Hallowell; _____: www.hallowell-list.com/#sle.
 - 2. Montel; SmartShelf: www.montel.com/#sle.
 - 3. Penco Products, Inc; _____: www.pencoproducts.com/#sle.

2.2 SHELVING - GENERAL

- A. See drawings for layout and sizes.
- B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 - 1. Provide hardware of type recommended by manufacturer for substrate.

2.3 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Shelf Capacity: Uniform distributed load of 50 psf, minimum.
 - 2. Finish: Baked enamel, medium gloss.
 - 3. Color: As selected by Architect from manufacturer's standard range.
 - 4. Provide single-face and double-face units where indicated.
 - 5. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.
 - 1. Metal Thickness: 16 gage, 0.0598 inch.
 - 2. Post Shape: Tee intermediate posts, angle end posts forming corners.
 - 3. Post Face Width: 2 inches, maximum.
 - 4. Connecting Hardware: Manufacturer's standard.
- C. Bracing: Formed sheet members.
 - 1. Back Sway Bracing: Either strap or panel; at back of each unit.
 - 2. Side Sway Bracing: Either strap or panel; at each side of each unit.
 - 3. Strap Sway Bracing: One strap installed diagonally, 16 gage, 0.0598 inch; welded, riveted, or bolted to uprights.
 - 4. Panel Sway Bracing: Formed sheet metal panels, 20 gage, 0.0359 inch; welded, riveted, or bolted to uprights.
- D. Shelves: Formed sheet, finished on all surfaces, with slots for dividers.
 - 1. Metal Thickness: 16 gage, 0.0598 inch.
 - 2. Shelf Connection to Posts: Manufacturer's standard.

2.4 OTHER METAL STORAGE SYSTEMS

- A. Interior Bicycle Storage (for use with "Big Wheels")
 - 1. Wall mounted rack
 - a. Capacity: Two bicycles
 - b. Materials: 1" OD 11 gauge metal tubing
 - c. Finish: Black rubber coated

- d. Dimensions: 18"W x 7"H x 17"D
- e. Basis of Design Manufacturers:
 - 1) Dero, A Playcore Company; www.dero.com
 - 2) Alternates will be considered provided they meet the technical specifications.

2.5 ACCESSORIES

- A. Label Holders: Steel, attached to front face of shelf.
 - 1. Size: 2-1/4 by 3/4 inches.
 - 2. Finish: Manufacturer's standard.
 - 3. Mounting: Slide-on.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Verify that walls are suitable for shelving attachment.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.4 CLEANING

- A. Clean shelving and surrounding area after installation.

3.5 PROTECTION

- A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 7500 - FLAGPOLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Flagpoles.

1.2 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.

1.3 SUBMITTALS

- A. Product Data: Provide data on pole, accessories, and configurations.
- B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Flagpoles:
 - 1. American Flagpole; ____: www.americanflagpole.com/#sle.
 - 2. Concord Industries, Inc; ____: www.concordindustries.com/#sle.
 - 3. Pole-Tech Co, Inc; ____: www.poletech.com/#sle.

2.2 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001.
 - 1. Material: Aluminum.
 - 2. Design: Tapered.
 - 3. Mounting: Ground mounted type.

4. Outside Butt Diameter: 5 inches.
 5. Outside Tip Diameter: 3 inches.
 6. Nominal Wall Thickness: 0.125 inches.
 7. Nominal Height: 20 ft; measured from nominal ground elevation.
 8. Halyard: Interior type with keyed access door.
 - a. Capability to fly two flags simultaneously is required.
 - b. Provide six keys.
- B. Performance Requirements:
1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 80 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.3 POLE MATERIALS

- A. Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.4 ACCESSORIES

- A. Finial Ball: Aluminum, 3 inch diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch size, aluminum with galvanized steel fastenings, two per halyard.
- D. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.
- E. Halyard: 5/16 inch diameter polypropylene, braided, white.

2.5 MOUNTING COMPONENTS

- A. Pole Base Attachment: Sleeve; steel base with base cover.

2.6 FINISHING

- A. Aluminum: Mill finish.
- B. Finial: Spun finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.2 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.3 INSTALLATION

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1 inch.

3.5 ADJUSTING

- A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 3013 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.

1.2 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.5 WARRANTY

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.1 APPLIANCES

- A. Sustainable Design Requirements:
 - 1. Require ENERGY STAR label for each product.
 - 2. Ice machine: ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
- B. Refrigerator, Standard: Free-standing, top-mounted freezer, and frost-free.
 - 1. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
 - a. Width: 30 inches
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 - 3. Features: Include glass shelves, automatic icemaker, light in freezer compartment, and in-door water and ice dispenser.
 - 4. Exterior Finish: Porcelain enameled steel, color white.
 - 5. Manufacturers:

- a. Frigidaire Home Products; ____: www.frigidaire.com/#sle.
 - b. GE Appliances; ____: www.geappliances.com/#sle.
 - c. Whirlpool Corp; ____: www.whirlpool.com/#sle.
- C. Refrigerator, Medical: Free-standing and frost-free.
 - 1. Capacity: 10.1 cubic ft.
 - a. Width: 24 inches
 - 2. Features: Include nine (9) lockable compartments.
 - 3. Exterior Finish: Porcelain enameled steel, color white.
 - 4. Basis-of-Design: Accucold Model FFAR-10-Locker
 - a. Substitutions: Not allowed.
- D. Ice Maker: Free-standing, under-counter, and frost-free
 - 1. Capacity: 25 pounds
 - a. Width: 15 inches
 - 2. Features: Include reversible door, water filter, automatic defrost, interior light, and ADA compliance.
 - 3. Exterior Finish: Porcelain enameled steel, color white.
 - 4. Manufacturers:
 - a. Frigidaire Home Products; www.frigidaire.com
 - b. GW Appliances; www.geappliances.com
 - c. Whirlpool Corp; www.whirlpool.com
 - 5. Range, Type ____: Electric, free-standing, with glass-ceramic cooktop.
 - a. Size: 30 inches wide.
 - b. Oven: Self-cleaning with electronic ignition.
 - c. Elements: Four (4).
 - d. Controls: Solid state electronic.
 - e. Features: Include automatic meat thermometer, storage drawer, oven door window, broiler pan and grid, and oven light.
 - f. Exterior Finish: Porcelain enameled steel, color white.
 - g. Manufacturers:
 - 1) Frigidaire Home Products; ____: www.frigidaire.com/#sle.
 - 2) GE Appliances; ____: www.geappliances.com/#sle.
 - 3) Whirlpool Corp; ____: www.whirlpool.com/#sle.
 - 6. Microwave: Over-the-range.
 - a. Capacity: 0.7 cubic ft.
 - b. Power: 1000 watts.
 - c. Features: Include turntable and 2-speed exhaust fan.
 - d. Exterior Finish: White.
 - e. Manufacturers:
 - 1) Frigidaire Home Products; ____: www.frigidaire.com/#sle.
 - 2) GE Appliances; ____: www.geappliances.com/#sle.
 - 3) Whirlpool Corp; ____: www.whirlpool.com/#sle.

2.2 LAUNDRY APPLIANCES

- A. Stackable Washer & Dryer (electric) Combo
 - 1. Washer Capacity: 3.9 cubic feet
 - 2. Dryer Capacity: 5.9 cubic feet
 - 3. Controls: Solid state electronic.
 - 4. Washer cycles: Normal.
 - 5. Dryer cycles: Normal, permanent press, knit/delicate, and air only.
 - 6. Washer features: Optional second rinse, bleach dispenser, fabric softener dispenser, self-clean lint filter, sound insulation, and end of cycle signal.

7. Dryer features: Interior light, reversible door, stationary rack, sound insulation, and end of cycle signal.
8. Finihs: Painted steel, color white.
9. Manufacturers:
 - a. Frigidaire Home Products; www.frigidaire.com
 - b. GE Appliances; www.geappliances.com
 - c. Whirlpool Corp.; www.whirlpool.com

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.3 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION

SECTION 11 4000 – FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Scope: Furnish all labor, materials, services, equipment and appliances required to provide and deliver all foodservice equipment hereinafter specified into the building, uncrate, assemble, hang, set-in-place, level, and completely install, exclusive of final utility connections.
- B. Related Work Specified Elsewhere:
 - 1. All plumbing, electrical and ventilating work required in conjunction with commercial foodservice equipment including rough-in to points indicated on mechanical drawings, and final connections from rough-in points, electrical service to points of connection and final connections shall be by Divisions 22, 23 and 26.
 - 2. Refrigeration work will be done by the Kitchen Equipment Contractor except for electrical and plumbing connections to and between compressors, blower coils, controls, etc. These final connections shall be by Divisions 22 and 26.
 - 3. All traps, steam traps, grease traps, line strainers, tail pieces, valves, stops, shut-offs, and fittings necessary for equipment specified will be furnished and installed under mechanical contract by Division 22 unless specifically called for otherwise under each item.
 - 4. All line and disconnect switches, safety cut-offs and fittings, convenience boxes or other electrical controls, fittings and connections will be furnished and installed under electrical contract by Division 26, unless specifically indicated otherwise in the item specifications. Starting switches for certain specified pieces of foodservice equipment are to be provided by Kitchen Equipment Contractor. Those starting switches, if furnished loose as standardized by Foodservice Manufacturers (other than fabricated items), shall be mounted and wired complete under Division 26.
 - 5. Any sleeves or conduit required for refrigeration, syrup tubing, or carbonation tubing will be furnished and installed under Division 22.
 - 6. Unless specifically called for in the Item Specifications, ventilating fans and all duct work between same and ceiling rough-in openings, and from same to discharge opening in building will be furnished and installed by Division 22.

1.2 DEFINITIONS:

- A. All references to the terms "Contractor", "Kitchen Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.
- B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative and the Foodservice Equipment Consultant.
- C. All references to the term "Consultant" or "Foodservice Equipment Consultant" in the specifications and/or on the drawings shall be defined to mean **NYIKOS ASSOCIATES, INC.** its employees, and authorized representatives and is referred to throughout the contract documents as if singular in number and masculine in gender.

- D. The phrase "The K.E.C. shall" or "by the K.E.C.", as applicable, is understood to be included as a part of each sentence, paragraph or article of these specifications unless otherwise indicated or specified.

1.3 QUALITY ASSURANCE:

A. Qualification of Suppliers:

1. Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.
 - a. Successful completion of jobs of comparable scope.
 - b. Have manufacturer's authorization to distribute and install specified factory items of equipment.
 - c. Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style rough-in drawings and brochures.
 - d. Maintain or have access to fabrication shop meeting N.S.F. requirements. If other than foodservice equipment suppliers own fabrication shop, obtain Consultant approval of fabrication shop desired to be used.
 - e. Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.

B. Qualification of Fabricators:

1. Fabricators shall be an N.S.F. approved organization with trained personnel and facilities to properly design, detail and fabricate equipment in accordance with the specifications and standard details contained herein.
2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval and listed as such under N.S.F. Standards No. 2 and No. 33.
3. Only one (1) fabricator shall be used for this project, and all equipment will be fabricated at the same shop. When units cannot be fully shop-fabricated, complete fabrication at project site.
4. Acceptable fabricators are:
 - a. Pro Stainless, Inc.; Keyser, WV
 - b. Commercial Stainless, Inc.; Bloomsburg, PA
 - c. Keystone Custom Fabricators, Inc.; Elizabeth, PA
 - d. Southern Equipment Fabricators, Inc.; Columbia, SC
 - e. Stainless Unlimited, Inc., Waldorf, MD
 - f. Other fabricators, as approved by Consultant.

C. Qualification of Manufacturers:

1. Manufacturers shall be regularly engaged in the production of items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

D. Standard Products:

1. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturer's latest design that complies with the specifications which have been produced and used successfully on other projects and in similar applications.
2. Discrepancies within contract documents should immediately be brought to the attention of the Consultant in writing for clarification prior to fabrication or ordering of standard items.

1.4 PLANS & SPECIFICATIONS:

- A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, drawings shall govern. Bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

1.5 SUBMITTALS:

A. General Requirements:

- 1. Within six (6) weeks or earlier, as required, assemble and submit all shop drawings, rough-in drawings, brochures, color samples, etc. as a complete package. There will be no review of partial submittals.
- 2. Any and all costs, to all trades and parties involved, arising from delay of project due to non-submittal of the complete package by the K.E.C. within a reasonable time period shall be borne solely by the K.E.C.
- 3. Identify each submittal by project name, date, contractor, submittal name, and any other necessary information to distinguish it from other submittals.

B. LEED Submittals: Comply with Section 01 3329.

- 1. Water Efficiency Prerequisite 2: Indoor Water Use Reduction
 - a. Hand washing sink faucets: Water usage in gallons per minute (gpm)
 - b. Pre-rinse spray valves: Water usage in gallons per minute (gpm)
 - c. Commercial dishwashers: ENERGY STAR: Water usage in gallons per rack
 - d. Ice machine: ENERGY STAR and documentation demonstrating air-cooled or closed-loop cooling system.
- 2. EQ Credit 2: Low-Emitting Materials
 - a. For interior wet-applied adhesives and sealants: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.2-2019 and VOC content in g/L. Include volume of material applied per product.
 - b. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins.
- 3. EA Prerequisite 4: Fundamental Refrigerant Management and EA Credit 6: Enhanced Refrigerant Management
 - a. Documentation for equipment containing refrigerants over one-half (0.5) pound, stating type and quantity of refrigerant.

C. Shop Drawings:

- 1. Submit shop drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of equipment specified for custom fabrication including all accessories attached to each item.
- 2. Drawings shall be detailed and fully dimensioned to a minimum scale of 3/4"=1'-0" for plan and elevation views, and 1-1/2"=1'-0" for sections, based on the floor plan(s) and following item specifications. Drawings will be checked for thoroughness, accuracy, completeness, neatness, and returned for corrections, if necessary.

D. Rough-in Drawings:

1. Submit rough-in drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of detailed arrangement plans professionally prepared from architects dimensioned plans (not traced from Contract Documents) at a minimum scale of 1/4"=1'-0".
 2. Equipment Layout Plan showing arrangement of all items specified and identified on schedule of equipment listing item number, description, quantity, manufacturer, model number, and remarks.
 3. Ventilation Plan showing dimensioned locations of all duct openings for ventilators and dishmachines identifying size, c.f.m. required (exhaust and supply), static pressures, and connection heights.
 4. Plumbing/Electrical Plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
 5. Special Conditions Plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations/heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda and compressed gas lines.
- E. Equipment Brochures:
1. Submit electronic files in PDF format of manufacturer's illustrations and technical data for approval prior to procurement. All items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to accurately describe the item to be furnished as specified. Include all deviations from standard information (i.e., voltage, phase, load, etc.).
 2. Include a separate information sheet ahead of each illustration sheet showing all service connection sizes, electrical requirements, loads, consumptions, and all accessories specified.
 3. Manufacturer's suggested schematic drawings for connection of mechanical and electrical services for such items as booster heaters, disposers, or any other item of equipment that may require the same.
- F. Miscellaneous Shop Drawings:
1. Submit electronic files in PDF format of manufactured equipment specified requiring clarification and approval such as, walk-in cooler/freezer drawings, ventilator drawings, utility raceway drawings, and refrigeration system drawings.
- G. Operation and Maintenance Manuals:
1. Submit electronic files in PDF format for all mechanically operated equipment of standard manufacture. Include operating and cleaning/maintenance instructions, parts listing, recommended parts inventory listing and purchase source, copy of warranties, and similar applicable information.
 2. Brochure covers shall bear the job name, date, and name of contractor.
- H. Manufacturer's List:
1. The K.E.C. shall submit electronic files in PDF format a list of all manufacturer's representatives of the food service equipment such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers; to be presented after submission of manufacture data.
- I. Samples:
1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.
- J. Re-submission Requirements:
1. Shop Drawings:

- a. Revise initial drawings as required and resubmit in accordance with submittal procedures.
 - b. Indicate on drawings all changes which have been made in addition to those requested by Consultant.
- 2. Product Data and Samples:
 - a. Submit new data and samples as required for initial submittal.
 - b. Make all re-submittals within fourteen (14) working days from date of Consultants previous action.
- K. Approvals:
 - 1. After approval of the submittals listed above, furnish as many prints and copies as are required for the various trades, the Owner, the Architect, and the Consultant.
 - 2. The approval of the shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, finishing, quantities, and erection of work in strict accordance with the contract requirements, nor does it relieve him of the responsibility of furnishing material and workmanship not indicated on approved shop drawings but required for the completion of his work.
 - 3. Approval by the Consultant and/or Owner of the manufacturer's data submitted by the K.E.C. does not waive the responsibility of K.E.C. to furnish each item of equipment in complete compliance with the specifications and drawings. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approval and installation of this equipment at no additional cost to the Owner.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Delivery:
 - 1. Equipment shall be delivered to the job site only after the building is weather-safe and vandal-safe.
- B. Storage:
 - 1. Store equipment in an area convenient to the point of installation in such a way that it is protected from the weather and job hazards.
- C. Protection:
 - 1. Wrapping and protective coatings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.
- D. Damage:
 - 1. All responsibility shall rest with the K.E.C. for any damage or loss incurred prior to final acceptance. Such items as may be lost or damaged shall immediately be replaced or repaired to a new condition to the complete satisfaction of and at no additional cost to the Owner.

1.7 JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS:

- A. Include the work specified, shown or reasonably inferable as part of foodservice equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.8 REGULATIONS AND CODES:

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section.
 - 1. N.S.F. Standards: Comply with National Sanitation Foundation Standards and criteria, and provide N.S.F. "Seal of Approval" on each manufactured item and major items of custom-fabricated work.
 - 2. U.L. Standards: For electrical components and assemblies, provide either U.L. labeled products or, where no labeling service is available, provide a complete index of the components used as selected from the U.L. "Recognized Component Index".
 - 3. A.N.S.I. Standards: For gas-burning equipment, comply with A.N.S.I. Z21-Series standards. Comply with A.N.S.I. B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for water connection air gaps and vacuum breakers.
 - 4. A.G.A.: All gas-fired equipment shall be A.G.A. Approved, equipped to operate on the type gas available at the job site and shall contain 100% automatic safety shut-off devices.
 - 5. N.F.P.A. Standards: Comply with N.F.P.A. Bulletin 96 for exhaust systems and with N.F.P.A. Bulletins 17 & 96, and U.L. 300 for fire extinguishing systems.
 - 6. A.S.M.E. Code: Comply with A.S.M.E. boiler code requirements for steam generating and steam heated equipment. Provide A.S.M.E. inspection, stamps, and certification of registration with National Board.
 - 7. National Electric Code: Comply with N.E.C. Volume 5 for electrical wiring and devices included with foodservice equipment.
 - 8. All authorities having jurisdiction over this type of equipment and/or installation.
 - 9. Where specifications and/or drawings require mechanical, electrical or refrigeration work to be performed, such work shall be done in strict conformance to other portions of the Base Building Specification which sets forth standards for this type of work.
 - 10. Where there exists two standards or codes for one type of work, the stricter method shall govern.

1.9 WARRANTIES:

- A. Warrantee in writing all equipment and fabrication against defects and workmanship for a period of two (2) year from date of acceptance.
 - 1. Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency whom the Owner will call should malfunctions occur within the two-year (2) guarantee period.
- B. Refrigeration system compressors shall be warrantied for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, shall be furnished for two (2) years from date of acceptance, unless otherwise specified.

1.10 JOB CONDITIONS:

- A. Visit the job site to field check actual wall dimensions and roughing-in and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.
- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjamb, windows, etc. for the purpose of moving the equipment to its proper location with the Contractor. Any removal and rebuilding of walls,

partitions, doorjambs, etc. necessary to place the equipment, or if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the K.E.C., at no additional cost to the Owner.

- C. Notify the Consultant and Owner before fabrication of equipment of any discrepancies between plans and specifications and actual conditions on the job.
- D. Before finished floors, walls, and/or ceilings are in place, physically check the location of all "rough-ins" at the job site. Report discrepancies in writing.
- E. Any changes required after fabrication has been started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional cost to the Owner.
- F. If special hoisting equipment and operators are required, include such cost as part of the bid for this work.

1.11 CHANGES IN THE WORK:

- A. The Owner reserves the right to require reasonable modification to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.12 PATENTS:

- A. Hold harmless and save the Owner and its officers, consultants, servants and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or un-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.
- B. If the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner in writing. The contract price shall include all royalties or costs arising from the use of any or all of the above which are, in any way, involved in the contract.

1.13 CONTRACTOR'S WARRANTY:

- A. The Contractor represents and warrants:
 - 1. That he is financially solvent and that he is experienced in and competent to perform the types of work or to furnish the plans, materials, supplies or equipment, to be so performed or furnished by him.
 - 2. That he is familiar with all Federal, State, municipal, and department laws, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein, including, but not limited to, any special acts relating to the work or to the project of which it is a part.
 - 3. That such temporary and permanent work required by the contract as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.

4. That he has carefully examined the plans, specifications, addenda, if any, and the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may, in any way, affect the work or its performance.
5. That he has satisfied himself as to the existing openings and accesses to the foodservice area through which his equipment shall be required to pass and that he is responsible for his equipment being delivered in as many sections as necessary to conform to the available space dictated by these existing limitations.

1.14 SUBSTITUTIONS:

- A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.
- B. The K.E.C. may quote upon brands and models of equipment other than those specified as a substitute, but he must also bid the primary item. In the event that it is desired to request approval of substitute material, product, article, process, or item of equipment in lieu of that which is specified, submit a written request at the time of submitting bid on a separate sheet attached to, but not part of, the base bid, setting forth the proposed substitution in detail, including an itemized analysis of the addition or deduction in the amount of the contract, if any, which will result if the substitution is approved. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.
- C. The Contractor shall be held responsible for additional costs to himself or any other prime contractor for changes required to install materials, devices, equipment, etc., which the Contractor has substituted for that specified.
- D. The Owner reserves the right to award a contract or contracts based upon the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meaning and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.
- E. Whenever any product is specified in the Contract Documents by reference to the name, trade name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a standard of quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered. However, please take note that the plumbing, electrical, steam, heating, ventilating, and air-conditioning drawings prepared by the consulting engineers, have been engineered based on the first product named under each item number designation. Therefore, any other product which is submitted for approval in lieu of the primary item specified, shall conform to the rough-in requirements established for the first product named, as well as physical size and building construction requirements.
- F. Any equipment listed which is not in accordance with the provisions of these specifications will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant shall then have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these

specifications and will be final and binding, and the items shall be furnished and installed by the Contractor without change in the contract price at the time of completion.

- G. It shall be the responsibility of the K.E.C. to prove that substitutions are equal to specified items. **NYIKOS ASSOCIATES, INC.** as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. No substitutions shall be approved after bids are received.

1.15 DESIGN/MODEL CHANGE, DISCONTINUED ITEMS:

- A. All equipment specified shall be of latest design. Any improvements made in design and construction of prefabricated items before equipment is actually delivered to the project site, shall be incorporated in equipment, at no additional cost, provided such incorporation does not delay delivery date of equipment.
- B. In the event of an item being discontinued after specified and prior to delivery to project site, the K.E.C. shall be responsible for notifying the Consultant in writing of the discontinued item and request an alternate of equal performance, including all accessories, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for all moving parts. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. All guards shall provide easy access to the guarded parts.
- D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by the Consultant and the Owner in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional cost.
- E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. All gauges for sheet iron and sheet steel shall be U.S. Standard Gauges, and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<u>GAUGE</u>	<u>THICKNESS</u>	<u>GAUGE</u>	<u>THICKNESS</u>
#10	0.1406	#16	0.0625
#12	0.1094	#18	0.0500
#14	0.0781	#20	0.0375

- F. Materials or work described in words which have a well known and acceptable trade meaning shall be held to refer to such accepted meanings.

- G. Water Conserving Plumbing Fixtures: Provide water usage not to exceed, or to improve upon the following baselines for water conservation.
 - 1. Hand Washing Sink Faucets: 0.5 gallons per minute (gpm) at 60 psi
 - 2. Pre-rinse Spray Valves: 1.3 gallons per minute (gpm)
- H. Ice machine: ENERGY STAR labeled.
- I. Commercial Dishwashers: ENERGY STAR labeled.

2.2 MATERIALS:

A. Refrigeration Systems:

1. Self-contained:
 - a. Whether the units be top-mounted or cabinet-mounted, they shall be started by the K.E.C. and shall be tested for maintenance of temperature.
 - b. All units shall be furnished with condensate evaporators.
2. Remote: Provide and install complete refrigeration system(s), charged, started, and operating properly, according to the Item Specifications and the following.
 - a. Single stage compressors with air-cooled condensers operating within the recommended range of suction discharge pressure of economical operation and within the required capacity.
 - b. All units shall be new and factory assembled, to operate with the refrigerant specified. Refrigerant R-404 shall be used for all medium and low temperature applications. Due to the unsettled nature of refrigerants, no refrigerant shall be used with a phase-out date of less than ten (10) years from the date of installation.
 - c. Compressors shall be accessible hermetic type, Copeland or approved equal, and shall be equipped with high-low pressure control, liquid line drier, sight glass, suction and discharge vibration eliminator, and head pressure control.
 - d. The system shall have a factory mounted and pre-wired control panel complete with main fused disconnect, compressor circuit breakers, contactors, and time clocks wired for single point power connection.
 - e. The supporting frame shall be constructed of structural steel, fully welded, and protected against rust and corrosion with one (1) coat primer, and two (2) coats paint, unless otherwise specified.
 - f. Systems specified for outdoor installation shall be fully protected in a weather-proofed housing with louvered front panel and hinged top, constructed to resist rust and corrosion, and furnished with low ambient controls. Crankcase heater shall be provided with every compressor.
3. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the Board of Fire Underwriters or ASHRAE Standards, whichever is greater.
4. Each refrigeration item specification is written to provide minimum specifications and scope of work. All refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

<u>TYPE</u>	<u>REFRIGERATORS</u>	<u>FREEZERS</u>
a. Walk-In	+35° F./1.7° C.	-10° F./-23.3° C.
b. Reach-In	+35° F./1.7° C.	-10° F./-23.3° C.
c. Undercounter	+35° F./1.7° C.	-10° F./-23.3° C.
d. Fabricated	+35° F./1.7° C.	-10° F./-23.3° C.
e. Cold Pans	+0° F./-17.8° C.	
f. Work Rooms	+50° F./10° C.	

5. Provide (including payment if subcontracted) all electrical and refrigeration components needed by the completed system and complete (or have completed by the respective trades) all connections of and to said components.
 6. An evaporator coil defrost system shall be provided and installed by the K.E.C. on all refrigeration systems designed to operate at an evaporator coil temperature of less than +35° F. Evaporator coil units provided without electric defrost feature shall be installed with a solenoid valve in the liquid line, controlled by the time clock so as to shut off the flow of refrigerant and allow the compressor to pump down and shut off by activation of the pressure control switch.
 7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
 8. Verify and provide manufacturer's certification that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
 9. All refrigeration systems shall be installed and wired in strict conformance with the manufacturer's instructions and recommendations.
- B. Motors and Heating Elements:
1. Motors up to and including 1/2 HP shall be wired for 120 volt, single phase service. Motors larger than 1/2 HP shall be wired for 208 volt, single or three phase service as indicated. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Insulation shall be N.E.M.A. Class B or better.
 2. Heating elements having a connected load up to and including 1,000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the drawings.
 - a. Any heating element larger than 1,000 watts or any combination of elements in one fixture totaling more than 1,000 watts shall be wired for 208 volt single or three phase service, as indicated on the drawings.
 - b. Fixtures having multiple heating elements may be wired for three phase service with the load balanced as equally as possible within the fixture.
- C. Switches and Controls:
1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent graphics, conspicuously labeled, to assist the user of each item.
 2. Mount switches and controls directly adjacent the piece of equipment for which it involves, on operator's side of counter body apron, out of view to the public.
 3. Provide on or for each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating and in accordance with Underwriter's Code wherever such equipment is not built in. All other line switches, safety cut-outs, control panels, fuse boxes, other control fittings and connections, when not an integral part of the unit or furnished loose by the manufacturer will be furnished and installed by the Electrical Contractor, unless otherwise specified. All electrical controls, switches, or devices provided loose for field installation as a part of the item specified shall be installed in the field by the Contractor unless otherwise specified.

4. Appliances shall be furnished complete with motors, driving mechanisms, starters, and controllers, including master switches, timers, cut-outs, reversing mechanisms, and other electrical equipment if and as applicable.
- D. Cover Plates:
1. All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless steel cups, or mounted onto removable cover plates in such a fashion as to not protrude or interfere with the operation of each item.
 2. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches and controls furnished by the K.E.C., and shall match the material and finish of the equipment to which they will be fastened.
- E. Wiring and Conduit:
1. Wiring shall be properly protected in N.E.M.A. and U.L. approved metal enclosures. Only rigid steel conduit shall be used, zinc coated where unexposed and chrome plated where exposed. All wiring shall be run concealed wherever possible.
 2. All equipment furnished under this contract shall be so wired, wound, or constructed so as to conform with the electrical characteristics at the job site.
 3. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
 4. Furnish all foodservice equipment completely wired internally using wire and conduit suitable for a wet location. Where an Electrician's services are required, the work shall be done in the K.E.C.'s factory or at his expense at the job site at no additional cost to the Owner. Provide all electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a master circuit breaker panel with all wires neatly tagged showing item number, voltage characteristics, and load information. Final connection shall be made by the Electrical Contractor.
- F. Cords, Plugs, and Receptacles:
1. The Electrical Contractor shall provide three- or four-wire, grounding-type receptacles for all wall and floor mounted outlets to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment, as indicated on drawings and item specifications.
 2. K.E.C. shall coordinate with the Electrical Contractor so that the receptacles provided will match the specific plugs provided as part of the plug-in equipment. Any changes in cords and plugs required in the field due to lack of coordination between the Electrical Contractor and the K.E.C. shall be the latter's responsibility.
 3. Reduce the length of all cords furnished with the specified equipment to a suitable or appropriate length so they do not interfere with other equipment or operations.
 4. Pedestal receptacles that are part of fabricated equipment exposed to view, shall be similar to T&S Model No. B-1508DD single face, single gang or Model No. B-1528DD single face, double gang.
- G. Water Inlets:
1. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning. Where exposed to view, piping and fittings shall be chrome-plated.
- H. Drain Lines:
1. Plumbing Contractor shall provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes in accordance with Plumbing Rough-In

- Plans, chrome-plated where exposed. Extend to a point at least 1" (or as required by local codes) above the rim of the floor drain, cut bottom on 45° angle and secure in position.
2. All horizontal piping lines shall be run at the highest possible elevation and not less than 6" above finished floor, through equipment where possible.
 3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks of more than one thread at the fitting.
 4. All steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
 5. Provide suitable pressure regulating valves for all equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions.

I. Faucets, Valves and Fittings:

1. All sinks shall be fitted with chromium plated, swing spout faucets of same manufacturer throughout as follows, or otherwise specified in Item Specifications.
 - a. Prep and Utility Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-231.
 - b.) Fisher Manufacturing Company, Model 3253.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-221.
 - b.) Fisher Manufacturing Company, Model 3313.
 - b. Pot Sinks:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-290.
 - b.) Fisher Manufacturing Company, Model 5214.
2. Pre-Rinse Assemblies:
 - a. Splash-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-133 with B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2210 with 2902-12 wall bracket.
 - b. Deck-Mounted:
 - 1.) T&S Brass and Bronze Works, Inc., Model B-143 with B-510 mixing valve and B-109 wall bracket.
 - 2.) Fisher Manufacturing Company, Model 2810 with 2805-CV mixing valve and 2902-12 wall bracket.
3. Vacuum Breakers:
 - a. General Use:
 - 1.) Fisher Manufacturing Company, Model 3990-8000.
 - b. Disposers:
 - 1.) Splash-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-455.
 - b.) Fisher Manufacturing Company, Model 3990.
 - 2.) Deck-Mounted:
 - a.) T&S Brass and Bronze Works, Inc., Model B-456.
 - b.) Fisher Manufacturing Company, Model 3991.
4. Trough Inlets:
 - a. Fisher Manufacturing Company, Model No. 2905.
5. Other specialty faucets, pre-rinse assemblies, vacuum breakers, and trough inlets, as specified under Item Specifications.
6. All sink compartments shall be fitted with 2" NPT male, chrome-plated, brass rotary waste valves complete with overflow assemblies and stainless steel strainers.
 - a. Prep and General Utility Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6100.

- b. Pot Sinks:
 - 1.) Fisher Manufacturing Company, Model No. 6102.
 - 7. Refer to Division 22 for all other fittings.
- J. Metals and Alloys:
 - 1. Stainless steel sheets shall conform to ASTM 240, Type 302, Condition A, 18-8, of U.S. Standard Gauges as previously indicated under paragraph 2.1.E.
 - a. All exposed surfaces shall have a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view.
 - b. All sheets shall be uniform throughout in color, finish, and appearance.
 - c. Rolled shapes shall be of cold rolled type conforming to ASTM A36.
 - 2. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
 - 3. Where galvanized metal is specified, it shall be copper-bearing galvanized iron, cold-rolled, stretcher leveled, bonderized, re-rolled to insure a smooth surface, and used in the largest possible sizes with as few joints as necessary.
 - 4. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, and to sheets in conformance with ASTM A526, coating designation G-90.
- K. Castings:
 - 1. Castings shall consist of corrosion resisting metal (white metal) containing not less than 30% nickel. All castings shall be rough ground, polished, and buffed to bright lustre and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.
- L. Hardware and Casters:
 - 1. All hardware shall be of heavy duty type, satin finished chromium plated brass, cast or forged or highlighted stainless steel of uniform design. All hardware shall be a well known brand, and shall be identified by the manufacturer's name and model number for easy replacement of broken or worn parts.
 - 2. Casters on custom built equipment shall be heavy duty type, ball bearing, solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.
 - a. Solid material wheels are to be provided with stainless steel rotating wheel guard.
 - b. All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.
 - c. All equipment specified with casters shall have a minimum of two (2) with brakes installed on opposite corners, unless otherwise noted.
- M. Locks:
 - 1. When specified, doors and drawers of all custom fabricated or manufactured equipment shall be provided with cylinder locks, disc tumbler type with stainless steel faceplate as manufactured by Standard-Keil Mfg. Co., or approved equal.
 - a. Provide two (2) sets of keys for each lock.
 - b. All locks shall be keyed alike, except at cashiers stations or unless otherwise specified.
- N. Thermometers:
 - 1. All fabricated refrigerated compartments shall be fitted with exterior mounted, adjustable, dial or digital thermometers with flush bezels, and shall be calibrated after installation.
- O. Sealants:

1. Sealant, wherever required, shall conform to ASTM C 920; Type S Grade NS, Class 25, Use Nt, with characteristics that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 and N.S.F. RTV-732 for use in areas where it comes in contact with food.
2. Dow-Corning #780 or General Electric "Silastic", or approved equal, in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers recommendations for a smooth, sealed finish.

P. Millwork:

1. All millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warpage; and of the best grade for their particular function. All wood shall be well seasoned, kiln dried, and shall have an average moisture content of 8%, a max. of 10% and a min. of 5%.
2. Plywood and other woodwork of treatable species, where so required by code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on the surface to be concealed.
3. Concealed softwood or hardwood lumber shall be of poplar, douglas fir, basswood, red oak, birch, maple, beech or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant materials are required.
4. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45-pound density, except where the fire retardant treatment requires cores of lesser density.
5. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book-matched, center-matched, and sequence-matched. Surfaces shall be sequence and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.
6. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple or other approved close grain hardwood faces suitable for a paint finish.
7. Perforated hardboard shall be a tempered hardboard, 1/4" thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with 1/4" diameter holes spaced on 1" centers both ways.
8. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71.
9. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Product Standard CS-236-66, Type 1, or 2, Grade B (45 pound density), class 2: except where fire-retardant treatment is required the density shall conform to the treatment requirements.

Q. Plastic Laminate:

1. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect.

- a. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1, 1/16" thick, satin finish, with rough sanded backs.
 - b. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical Surface), Grade HP, Class 1, non-forming, satin finish, 1/32" thick or heavier.
 - c. Curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish.
 - d. Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.
2. Adhesives:
 - a. For application of plastic laminate to wood substrates of horizontal surfaces shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C, producing a waterproof bond.
 - b. For applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C.
 - c. Contact adhesive will not be acceptable.
- R. Solid Surfacing:
1. Homogeneous solid sheets of filled polyester and acrylic resin complying with material and performance requirements of ANSI Z124.3, for Type 5 or Type 6, without a pre-coated finish.
 2. Install as directed by manufacturer of specified material for commercial foodservice use for the areas and with the units specified and shown.
 - a. Especially isolate heated drop-in units per solid surfacing manufacturer's direction. This includes any blocking, insulation, reflective tape, additional layers of material, s/s collar, etc.
 3. Structural support for 1/2" thick counter tops must not allow more than 6" void in any direction; for 3/4" an 8" void is maximum.
 4. Provide additional support around all drop-in and countertop mounted equipment to preclude future deflection of material, especially at heated units.
 5. Countertop edges must be built-up to 1-1/2" with same material (or as specified). Unsupported overhanging edges must not exceed 2".
 6. Typical manufacturer's:
 - a. DuPont "Corian".
 - b. Formica "Surell".
 - c. Wilsonart "Gibraltar".
 - d. Avonite.

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, overselves and underselves.
 - b. Tighten stud bolts for maximum compression of sealant.
- 5. Hi-Liting:
 - a. All horizontal edges of stainless steel tops, splashes, tops of raised rolled rims, and edges of all exposed doors, handles and shelf edges shall be hi-lited, in uniform design by grinding with abrasive not coarser than #240 grit, then polishing with compound to a uniform mirror finish.
- 6. Polishing:
 - a. The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge.
 - b. Where sinks and adjacent drainboards are equipped with backsplash, the grain of the polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.
- 7. Finishes:
 - a. Paint and coatings shall be of an N.S.F. approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations, and shall be applied in accordance with the manufacturers recommendations.
 - b. All exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, primed with rust inhibiting primer, de-greased, and finished with two (2) coats of glossy enamel grey hammertone paint, unless otherwise noted.
 - c. Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300° Fahrenheit.
 - d. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable after the equipment installation is complete at the job site, and final clean-up has begun.

D. Construction:

- 1. Legs:
 - a. All tubular stands for open base tables, sinks, or dishtables shall have legs constructed of 1-5/8" O.D. stainless steel tubing, with 1-1/4" O.D., #16 gauge stainless steel crossbracing running between legs at a point 10" above finished floor.
 - b. All joints between legs and crossbracing shall be welded and ground smooth, full 360°.
 - c. The top end of legs shall be closely fitted into fully-enclosed stainless steel conical gussets no less than 3" high, similar to Klein #481-58 or #483-58, or approved equal.

- d. Gussets shall be fully welded to framing reinforcing members, so that, set screw is not visible from front.
 - e. Legs without crossrails will not be accepted.
 - f. Legs shall be spaced at not more than 5'-6" on centers, unless otherwise specified.
2. Feet:
- a. All tubular legs will be swedged for appearance and close fit to United Show Case #BF-158, or approved equal, fully enclosed, stainless steel bullet-shaped foot.
 - 1.) The foot shall be threaded into a collar and completely welded inside the tubular leg to permit a maximum adjustment of 2" without any thread exposure.
 - 2.) Threads shall be National Course Series Class 2 fit or better, machined to prevent end play when foot is at maximum adjustment.
 - 3.) The bullet-shaped foot shall have slightly rounded bottom to protect the floor, and a minimum bearing surface of 3/4" diameter of stainless steel-to-floor contact.
 - 4.) Bottom of tubular leg shall be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris.
 - b. Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 3" in diameter at the top, United Show Case #CM-68B, or approved equal.
 - 1.) The bottom fully enclosed, stainless steel, bullet-shaped foot threads up into the inside of the upper member, with a male threaded 5/8" bushing to permit maximum adjustment of 2" without thread exposure.
 - 2.) The upper section shall be stamped in a neat design with a flared inverted shoulder and fully welded to a base plate designed for anchoring to the channel underbracing.
3. Table Tops:
- a. Tables shall be constructed of stainless steel, and of a thickness not less than #14 gauge with 1-3/4" by 120° rolled edges, or as otherwise specified and detailed.
 - b. All corners shall be bull-nosed and of the same radius as rolled edges.
 - c. Joints where required shall be butt-welded and ground smooth to present a uniform one-piece appearance.
 - d. All tops shall be reinforced on the underside with a fully welded framework of 1-1/2"x1-1/2"x1/8" galvanized steel angles with the framing extending around the top perimeter and crossbraced on 24" maximum centers.
 - e. 1"x4"x1" galvanized or stainless steel, fully welded, cross channel, closed end members placed at each pair of legs with one (1) channel running lengthwise will also be acceptable.
 - f. All tops shall be reinforced so that there will be no noticeable deflection.
 - g. Metal tops where adjacent to walls or other items of equipment, shall be constructed with integral, coved, back and/or endsplashes as required and specified in accordance with the standard details contained herein. Close all ends of splashes.
4. Enclosed Bases:
- a. All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each item.
 - b. Ends of body shall terminate at front or operator's side in a 2" wide mullion, vertical, and completely enclosed. All intermediate mullions shall be completely enclosed.
 - c. The bases shall be reinforced at the top with a framework of 1-1/2"x1-1/2"x1/8" galvanized angles, with all corners mitered and welded solid.
 - d. Underside of top shall be reinforced with channels and gussets where necessary. Additional angles and cross members shall be provided to reinforce shelves and support tops under heavy tabletop equipment.

- e. Where sinks or other drop-in equipment occur, provide additional reinforcing extending crosswise, both sides of opening.
 - f. In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, with the tops continuing to the wall line with integral, coved splashes as specified. Extend vertical face of body to the wall line only. This will permit adjustment to wall irregularities. Vertical trim strips will not be accepted.
 - g. Bodies shall be fitted with counter style stainless steel legs as hereinbefore specified.
5. Drawers:
- a. Drawers, where specified, shall have removable pan inserts of #18 gauge stainless steel, and shall be approximately 20"x20"x5" deep unless otherwise specified.
 - 1.) Perimeter top edge shall be flanged out 1/2".
 - 2.) All interior horizontal corners shall be rounded on a 1" radius, and all interior vertical corners shall be rounded on a 2" radius.
 - b. Fronts shall be double pan #16 gauge stainless steel construction, 1" thick, insulated with a semi-rigid, fiberglass board, un-faced, having a three-pound density.
 - 1.) The top of the drawer face shall be formed as an integral pull by breaking the front pan back on a 45° angle 1", then straight up 1", back to front 1", and then down at the front 3/4".
 - 2.) Drawer front shall have all edges and corners ground smooth with a radius edge pull.
 - 3.) Provide hard rubber button bumpers attached to rear of drawer face at each corner.
 - c. The drawer shall have an all welded frame of 1"x1", #16 gauge stainless steel angles sized to fit the removable pan insert.
 - d. Drawers shall operate on #14 gauge full-extension slides with stainless steel roller bearings with hardened and ground raceways, Component Hardware, S52 Series, or approved equal. Slides shall be pitched approximately 3/8" per foot to permit self closing action.
 - e. Drawers shall be adequately and neatly fitted to the guides to permit easy operation without rattle or binding.
 - f. Slides and frame shall be reinforced to support a dead weight of 150 pounds when drawer is fully extended.
 - g. Adjustable stops shall be provided for each drawer at the fully-opened position, and be readily liftable by hand for easy removal of drawer.
 - h. All drawers not mounted inside a cabinet body shall be completely enclosed in an #18 gauge stainless steel box-type enclosure and suspended from angle framing under the fixture top. The housing bottom shall be flanged and welded to an #18 gauge stainless steel reinforcing channel extending across the open end.
6. Sliding Doors:
- a. Sliding doors shall be of the double pan type, with the exterior pan constructed of #18 gauge stainless steel with all four sides channeled and corners welded. The interior pan shall be similarly constructed of #20 gauge stainless steel, set into the exterior pan, and welded in place.
 - b. All doors shall be insulated with semi-rigid fiberglass board, un-faced, having a three-pound density. Styrofoam shall not be acceptable.
 - c. Doors 18" wide or greater, shall have internally welded 4" wide reinforcing channels to prevent warpage.
 - d. Each door shall be fitted with a positive flush-type stainless steel pull, Standard-Kiel #1262-1014-1283 recessed handle, or approved equal.
 - e. In the back of each door install a 1"x1", #16 gauge stainless steel angle stop welded in a suitable location to prevent the doors from overpassing the flush pulls.
 - f. Doors in the closed position shall overlap each other by no more than 2".

- g. Each door shall be fitted with two (2), 1-3/8" ball bearing sheaves fastened to 1"x1/8" stainless steel bar stock welded to the top corners of each door for suspending on an overhead #16 gauge stainless steel channel track. The hangers shall be tapped for 1/4"-20 thumb screw vertical locks which prevent the doors from jumping the track in operation while permitting easy removal for cleaning without tools.
 - h. Insure that the bottom of the doors are positively and continuously guided to assure proper alignment and passing regardless of the position of each door.
 - i. Provide hard rubber bumpers for doors to close against to insure quiet operation.
7. Hinged Doors:
- a. Hinged doors shall be of the same materials and construction as sliding doors previously specified.
 - b. Hinges shall be heavy duty, stainless steel, removable type, and fastened by tapping into 1/4"x3/4" stainless steel bar stock inside the door pan and behind the door jamb.
 - c. The door face shall be flush with the cabinet body when fully closed.
 - d. Size widths of doors equally when installed in pairs, or in series with other pairs, with no door being greater than 36" in width.
 - e. Doors shall be held closed by permanent magnetic closure devices of an approved type and of sufficient strength to hold the doors shut. Install two (2) per door (minimum), mounted to the door jamb, top and bottom, with opposing chrome-plated steel plates securely fastened to the inner panel of the doors.
8. Undershelves:
- a. All open base tables shall be provided with full-length undershelves of #16 gauge stainless steel fully welded to legs with all joints ground smooth and polished.
 - b. Front edge shall turn down 1-1/2" and under 1/2".
 - c. Turn up rear and ends 2", with integral coved radius, when specified.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" galvanized angle bracing mounted to underside, full length.
9. Interior Shelves:
- a. All interior shelves within cabinet bodies, enclosed bases and overhead cabinets, shall be of #16 gauge stainless steel.
 - b. Removable shelves shall be constructed in equal sections, and rest in 1-1/2"x1-1/2"x1/8" stainless steel angle frame. Cove all horizontal corners in accordance with N.S.F. requirements.
 - c. Stationary shelves shall have 2" turn-up on back and ends, and continuously welded to cabinet body, polished and ground smooth to form a one-piece interior free of any crevices.
 - d. Front edge shall turn down 1-1/2" and under 1/2", and finished with "z" bar forming completely enclosed edge for maximum strength and sanitation.
 - e. Provide 1-1/2"x1-1/2"x1/8" angle bracing mounted to underside, full length.
10. Elevated Shelves:
- a. Shelves over equipment not adjacent to a wall shall be mounted on 1" diameter #16 gauge stainless steel tubular standards neatly fitted with stainless steel base flanges, unless otherwise specified.
 - b. The top of the tubular standards shall be completely welded to #14 gauge stainless steel support channels, full width of overself.
 - c. Inside the tubular standard, and welded to same, provide 1/2" diameter steel tension rod extended through countertop and securely anchored to lower framework reinforcing with nuts and lock washers in such a manner as to assure a stable, sway-free structure.
 - d. If required by width, provide 1-1/2"x1-1/2"x1/8" stainless steel angle bracing mounted to underside, full length.
 - e. Cantilevered shelves, when called for, shall be #16 gauge stainless steel supported on #14 gauge stainless steel brackets welded to 1-5/8" O.D. stainless steel tubular

standards extending through the backsplash, and fully welded to the table framework. Provide Klein #481-SH welded sleeves where standards penetrate backsplash.

11. Wall Shelves:

- a. Open wall shelves shall be constructed of #16 gauge stainless steel with back and ends turned up 2", positioned 2" out from face of wall, with all corners welded, and supported on #14 gauge stainless steel brackets.
- b. Brackets shall be flanged inward beneath the shelf and at the wall 1-1/2" with intersecting flanges completely welded, and attached to shelf with studs welded to the underside and bolted with stainless steel lock washers and chrome-plated cap nuts.
- c. Each bracket shall be fastened to the wall with a minimum of two (2) 1/4"-20 stainless steel bolts anchored securely by means of toggles or expansion shields.

12. Sinks:

- a. All sinks shall be the size and shape as shown on drawings, and constructed of #14 gauge stainless steel with backs, bottoms and fronts formed of one continuous sheet and the ends welded in place.
- b. Sinks shall have all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
- c. Multiple compartment sinks shall be divided with double wall, #14 gauge stainless steel partitions with a 1/2" radius on top and all corners rounded as other corners, continuously welded, ground smooth and polished.
- d. The bottom of each compartment shall be creased to a die stamped recess, tapered and shaped to receive a lever type waste without the use of solder, rivets, or welding.
- e. Provide #14 gauge stainless steel waste lever angle bracket mounted to underside of compartment at front.
- f. The front and exposed ends of sinks shall be fabricated with a 1-1/2", 180° rolled edge. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
- g. Unless otherwise specified, two (2) faucet holes on 8" centers shall be provided, located over the center line of partitions between compartments, 2-1/2" down from splash break.
- h. Gussets for legs shall be fully welded all around to #12 gauge stainless steel triangular plates fully welded to underside of sink.
- i. Sinks fabricated into working surfaces shall be constructed of the same material and in like manner to sinks specified above, except rolled edge and backsplash shall be omitted and the bowl shall be completely welded integral and flush with the working surface. Where basket type wastes are called for, they shall be fitted with removable seats.
- j. Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.

13. Sink Drainboards:

- a. Drainboards shall be constructed of the same material as the sinks and shall be welded integral to same.
- b. The front portion of drainboards shall continue the 1-1/2", 180° rolled edge of sink bowls on a continuous and level horizontal plane.
- c. The surface of the drainboard shall pitch from 2-1/2" at the end furthest from the sink, to 3" at the bowl; or 1/8" per foot. In addition, the bottom surface shall be dished toward the center for complete drainage.
- d. The backsplash of the drainboard shall match the rear of the sink contour and shall be welded integral thereto, running parallel to the floor.

- e. Drainboards shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise.
 - f. Where disposer cones are fabricated into drainboards, additional 1"x4"x1" stainless steel channels shall be welded into the top framing, spanning the drainboard from front-to-back on both sides of the cone and located not more than 3" to either side.
 - g. Disposer control panels or switches shall be supported beneath drainboards, when specified, by means of a #12 gauge stainless steel mounting bracket.
14. Dishtable Tops:
- a. Dishtables shall be constructed of #14 gauge stainless steel with all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
 - b. Fronts and exposed ends shall be fabricated with a 3" high, 1-1/2", 180° rolled edge with rounded corners. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.
 - c. All tops shall slope 1/8" per foot (minimum).
 - d. Dishtables shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise fully welded between front-to-back channels.
 - e. Where tops fit into dishmachines, they shall turn down and into, forming a sealed watertight fit, and attached according to dishmachine manufacturers instructions.
 - f. On each side of dishmachine, tables shall be provided with integral splash shields as part of the backsplash.
 - g. Silicon filling of gaps caused by poor fit will not be acceptable.
 - h. On corner-type door machines, provide #14 gauge stainless steel wall-mounted, splash panel to protect adjacent wall, full width of door opening.
15. Cafeteria Style Counters:
- a. All counters shall be constructed as previously specified under Enclosed Bases.
 - b. Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, etc., whether a drop-in unit or a cutout for a portable unit.
 - c. Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counteredge.
 - d. The countertop shall be constructed of #14 gauge stainless steel, as previously specified, with all joints welded, ground and polished.
 - e. Fronts and exposed ends shall be stainless steel, plastic laminate or other material as noted in the Item Specifications.
 - f. All display glass shelving shall be 1/4" polished plate glass and fully trimmed with #18 gauge stainless steel formed channels. Top shelves shall be the same width as the shelf below. Shelves shall be supported on 5/8" square, #16 gauge stainless steel perimeter tubing fully welded to 1-1/4" square, #16 gauge stainless steel tubing uprights.
 - g. Provide appropriate adjustable glass sneeze or breath guards trimmed in stainless steel along front, entire length, mounted in Klein 4465-A brackets.
 - h. Protector shelf over hot food wells shall be #16 gauge stainless steel supported on 1-1/4" square, #16 gauge stainless steel tubing uprights, with 1/4" polished plate glass front and end panels trimmed in #18 gauge stainless steel channels. When specified for self-service, mount bottom edge of front panel 8" above countertop.
 - i. All display and protector shelves shall be furnished with full-length fluorescent lights wired to on/off switch in counter apron, with lamps and protective shields. Conceal all wiring in tubular uprights.

- j. Refer to Item Specification for changes, as required.
- k. Counter shall be internally wired complete by the K.E.C., and in such a way as to meet the requirements of the Electrical Code of the job location.

2.4 EQUIPMENT:

- A. All items listed on the Contract Documents under the heading "Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed Itemized Specifications.
- B. Manufacturer's names and model numbers are shown establishing quality, size, and finish required, representing the Owner's and Consultant's requirements and basis for bid. Equipment is listed hereinafter with same item numbers as shown on Contract Documents.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Before beginning the installation of foodservice equipment, the spaces and existing conditions shall be examined by the K.E.C. and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect in writing.
 - 1. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.
 - 2. Beginning installation shall constitute acceptance of the area.

3.2 PREPARATION:

- A. Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.
- B. Field verify all measurements at the building prior to fabrication of custom equipment. Coordinate measurements and dimensions with rough-in and space requirements.

3.3 INSTALLATION:

- A. The K.E.C. shall coordinate his delivery schedule with the Contractor to ensure adequate openings in the building to receive the equipment.
- B. Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.
- C. Provide a competent, experienced foreman to supervise installation and final connections with other trades.
- D. Remote Refrigeration Systems:
 - 1. All refrigeration work where applicable to this contract shall be accomplished in an approved manner, using finest quality fittings, controls, valves, etc.

2. Refrigeration items shall be started up, tested, adjusted, and turned over to the Owner in first class condition and left running in accordance with the manufacturer's instructions.
3. Refrigeration lines and hook-ups shall be completed by the K.E.C. with the exception of electric, water, and drain line final connections unless otherwise specified.
4. All copper tubing shall be refrigerant grade A.C.R. or type "L".
5. Silver solder and/or Sole-Phase shall be used for all refrigerant piping. Soft solder is not acceptable.
6. All refrigerant lines in pipe sleeves or conduit shall be effectively caulked at ends to prevent entrance of water or vermin and at penetrations through walls or floors.
7. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers at 6'-0" o.c. maximum.
8. Wrap drain line in freezer compartment(s) with approved heat-tape for final connection by Electrical Contractor.

E. Sealing and Caulking:

1. Prior to the application of sealant, all surfaces shall be thoroughly cleaned and degreased.
2. Apply around each unit of permanent installation at all intersections with walls, floors, curbs or other permanent items of equipment.
3. Joints shall be air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes.
4. In general, joints shall be not less than 1/8" wide, with backer rod to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
5. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" radius.
6. Provide sealant-filled joints up to 3/4" in joint width. Trim strips for wider joints shall be set in a bed of sealant and attached with stainless steel fasteners, 48" o.c., or less, to insure suitable fastening and prevent buckling of the metals fastened.

F. Cutting:

1. All cutting, fitting, or patching required during installation shall be accomplished by the K.E.C., at his own expense, so as to make the work conform to the plans and specifications.
2. The K.E.C. shall not cut or otherwise alter, except with the consent of the Owner, the work of any other Contractor.
3. Provide cut-outs in foodservice equipment where required to run plumbing, electric, or steam lines through equipment items for final connections.

3.4 FIELD QUALITY CONTROL:

A. Inspection:

1. Provide access to shop fabrication areas during normal working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative.
2. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications, and approved drawings.

B. Start-Up and Testing:

1. Delay start-up of foodservice equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.

3. Supply a trained person or persons who shall start up all equipment, test and make adjustments as necessary, resulting in each item of equipment, including controls and safety devices, performing in accordance with the manufacturer's specifications.
 4. All gas-fired equipment shall be checked by the local gas company as to calibration, air adjustments, etc., and adjustments made as required.
 5. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.
- C. Demonstration:
1. Provide an operating demonstration of all equipment at a time of Owner's convenience, to be held in the presence of authorized representatives of the Architect and Owner.
 2. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.
 3. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.
 4. Furnish complete, bound, operation/maintenance manuals and certificates of warranty for all items of equipment provided, in accordance with Article 1.5 Submittals, Paragraph F, at this demonstration time.

3.5 ADJUST AND CLEAN:

- A. Upon completion of installation and tests, clean and sanitize foodservice equipment, and leave in condition ready for use in food service.
- B. Remove all protective coverings, and thoroughly clean equipment both internally and externally.
- C. Make and check final adjustments required for proper operation of the equipment.
- D. Restore finishes marred during installation to remove abrasions, dents, and other damages. Polish stainless steel surfaces, and touch-up painted surfaces with original paint.
- E. Clean up all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and put the site in a neat, orderly, and broom-clean condition.

3.6 EQUIPMENT SCHEDULE:

ITEM #1: FLY FAN -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL DIVISION)

QUANTITY: One (1)

ITEM #2: UTILITY CART, MOBILE

QUANTITY: Three (3)
 MANUFACTURER: Steril-Sil Company
 MODEL NO.: UTC-302 (N058)
 PERTINENT DATA: Heavy-Duty, Stainless Steel, 1,000-lb. Capacity, Two-Shelf, NSF Model
 UTILITIES REQ'D: ---
 ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Fixed front casters, swivel and locking rear casters and bumpers.

ITEM #3: WALK-IN COOLER/FREEZER

QUANTITY: One (1)
MANUFACTURER: Thermo-Kool
MODEL NO.: Indoor Installation (N058)
PERTINENT DATA: 4" Thick Durathane Construction - Class I; NSF Construction
UTILITIES REQ'D: 1750W, 120V, 1PH; (2) 3/4" IW
ALTERNATE MFRS.: Kolpak; Bally

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. Two Section Unit: 22'-2" L x 9'-8" D x 8'-6" H. Interior width: Cooler - 11'-2", Freezer - 10'-2".
2. Exterior Finish:
 - 26 GA stucco embossed galvanized steel where unexposed.
 - 20 GA stucco embossed stainless steel where exposed.
3. Interior Finish:
 - White acrylic enamel baked-on .040 stucco embossed aluminum walls.
 - White acrylic enamel baked on 26 GA smooth galvanized steel ceiling.
4. Interior Floor:
 - 4" prefabricated floor panels installed in 6" deep floor recess over hot asphalt paper or 10 MIL polyethylene sheets on building floor slab.
 - 2" setting bed with two (2) layers of wire reinforcing mesh fabric with Altro Stronghold 30 sheet vinyl applied with 6" high integral coved base, interior and exterior of box, installed over prefabricated floor panel by Flooring Contractor.
5. Entrance Door:
 - Two (2) flush-mounted, right-hand hinged self-closing doors, with 34" x 76" net opening.
 - Polished chrome camlift hinges with lift off capability. One (1) extra hinge per door, three (3) total.
 - Kason #1236 polished chrome lever-action handle with knob turn release and cylinder lock.
 - Kason #09440004 polished chrome mortise dead-bolt lock, factory mounted.
 - Hydraulic door closer.
 - Standard 2" diameter dial indicating thermometer factory mounted, each compartment.
 - 36" high aluminum diamond tread kickplates, interior and exterior of door, frame and jamb.
 - 14" x 24" heated observation windows, both compartments.
 - Foot treadle door opener.
 - Kason #1806 LED light fixture with high-impact plastic cover centered over door opening to avoid conflict with shelving, each compartment. Extend wiring in conduit, foamed within door panel header, to junction box mounted on top of walk-in ceiling, each compartment.
 - Undercut doors for 6" floor depression. See Sheet K102 for details.
 - Kason #907 interior door handle, factory mounted, with concealed metal backing plate.
 - Round vinyl door bumper mounted to front exterior face to protect handle from puncturing wall when door in full open position.
 - Engraved phenolic plastic compartment sign - 12" long x 2" high; white in color with 1" high blue CAPITAL letters mounted on each door above observation window; (1) - COOLER, (1) - FREEZER.
 - 12-gauge heavy-duty stainless steel heated threshold, each compartment.
6. 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; verify finished ceiling height.
10. Provide and install closure panels of matching exterior finish between top of walk-in and finish ceiling; verify finished ceiling height.
11. All electrical conduit shall be run concealed above walk-in ceiling, per Detail Sheet K-104.
12. Evaporator coil drain lines shall be run to floor drain with "P"-trap on exterior of box by K.E.C. Pitch drain lines 1" per foot of horizontal run.
13. Black flexible "Armaflex" insulation applied to exposed drain lines and fittings within interior of box by K.E.C.
14. Spiral heat tape applied to drain line within interior of freezer compartment prior to application of insulation by K.E.C.
15. Coordinate location of sprinkler head drops and provide penetrations, where necessary.
16. K.E.C. to seal and insulate all openings to prevent infiltration of warm air into cooler/freezer compartments.
17. Accessories:
 - One (1) Kolpak #HAR-C2-N1 air shield mounted vertically on the hinge side of doorjamb inside each walk-in compartment. Electrical Contractor to provide power receptacle and final connection.
 - #16 ga. stainless steel hat-channel bumper rail with closed ends installed to front face of walk-in, full-length, mounted @ 36" A.F.F. Provide 1/8" diamond tread kickplates from top of finish floor coved base to bottom of bumper rail.
 - 6" high 1/8" thick aluminum cove baseboard, to be installed where panels are exposed at kitchen side, fastened with countersink screws and seal with gray-color silicone sealant to finish floor and walk-in panels.
18. Quality Inspection Requirement:
 - Walk-In shall be completely erected at the manufacturer's facility prior to shipment and a quality control inspection performed on the assembled structure. A digital photograph of the assembled walk-in shall be provided for the K.E.C. permanent records and included in the operation and maintenance manuals.

ITEM #4: COOLER REFRIGERATION SYSTEM

QUANTITY: One (1)
MANUFACTURER: ColdZone
MODEL NO.: CFO100M4S-E (N058)
PERTINENT DATA: Uni-Pak, Air-Cooled, Outdoor Installation, With EcoNet® Intelligent Control
UTILITIES REQ'D: 4.1A, 208V, 3PH
ALTERNATE MFRS.: RDT; Omni-Temp

Furnish and set-in-place per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-102; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, 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 CL6A094SDARE; 1.6A, 120V, 1PH
 - System to operate at +35°F.
 - Furnished complete with thermostat, solenoid and expansion valves factory mounted ready for final connection by Refrigeration Contractor.
 - EcoNet® Intelligent Control with remote monitoring and diagnostics.
 - Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.
7. Unit factory pre-wired to main-fused disconnect switch.
8. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.

ITEM #5: FREEZER REFRIGERATION SYSTEM

QUANTITY: One (1)
MANUFACTURER: ColdZone
MODEL NO.: CFO350L4S-E (N058)
PERTINENT DATA: Uni-Pak, Air-Cooled, Outdoor Installation, With EcoNet® Intelligent Control
UTILITIES REQ'D: 11.9A, 208V, 3PH
ALTERNATE MFRS.: RDT; Omni-Temp

Furnish and set-in-place per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-102; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, Low Temperature, R-448A.
2. System located outdoors on roof. Curb with pitch-pocket furnished and installed by Contractor. Refer to Mechanical Roof Plan for exact location.

ITEM #5: (Continued)

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 CL6E105DDARE, 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.
 - EcoNet® Intelligent Control with remote monitoring and diagnostics.
 - Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.
7. Unit factory pre-wired to main-fused disconnect switch.
8. Factory certified installers to provide complete refrigeration system warrantee: five (5) years for the compressor, two (2) years for the condensing unit, and two (2) years for all parts of the evaporator coil.

ITEM #6: DUNNAGE RACK, MOBILE

QUANTITY:	Four (4)
MANUFACTURER:	InterMetro Industries Corporation
MODEL NO.:	Super Erecta (N058)
PERTINENT DATA:	With Wire Mat, Chrome-Plated
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) #MHP33C chrome-plated unit; 18" W x 36" L.

Freezer:

1. One (1) #MHP33C chrome-plated unit; 18" W x 36" L.

Dry Storage:

1. One (1) #MHP33C chrome-plated unit; 18" W x 36" L.

Receiving:

1. One (1) #MHP33C chrome-plated unit; 18" W x 36" L.

ITEM #7: SHELVING, MOBILE

QUANTITY: Twelve (12)
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. Two (2) #MX1836G sections; 18" W x 36" L x 4-tier high.
2. Four (4) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Twenty-four (24) #MX63UP polymer posts for stem casters, 61-3/16" high.
4. Twelve (12) #5MPX polyurethane swivel casters with bumpers.
5. Twelve (12) #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. Three (3) #MX1836G sections; 18" W x 36" L x 4-tier high.
2. Three (3) #MX1848G sections; 18" W x 48" L x 4-tier high.
3. Twenty-four (24) #MX63UP polymer posts for stem casters, 61-3/16" high.
4. Twelve (12) #5MPX polyurethane swivel casters with bumpers.
5. Twelve (12) #5MPBX polyurethane swivel casters with brakes and bumpers.
6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #8: SHELVING

QUANTITY: Eight (8)
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:

ITEM #8: (Continued)

Dry Storage:

1. Four (4) #MQ1836G sections; 18" W x 36" L x 5-tier high.
2. Four (4) #MQ1848G sections; 18" W x 48" L x 5-tier high.
3. Thirty-two (32) #MQ74UPE polymer posts, 73-3/16" high.
4. Sixteen (16) #5MPX polyurethane swivel casters with bumpers.
5. Sixteen (16) #5MPBX polyurethane swivel casters with brakes and bumpers.
6. Plastic wedge lock connectors, quantity as required.
7. Locate bottom shelf @ 12" A.F.F., space remaining shelves equally.

ITEM #9: HAND SINK

QUANTITY:	Five (5)
MANUFACTURER:	Eagle Foodservice Equipment Company
MODEL NO.:	HSA-10-FAW-LRS (N058)
PERTINENT DATA:	Wall Mounted Assembly, With Wrist-Action Handles
UTILITIES REQ'D:	1/2" HW, 1/2" CW, 1-1/2" W
ALTERNATE MFRS.:	Advance/Tabco

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Complete sink assembly including faucet, P-trap, tailpiece, strainer and wall mounting bracket.
2. Accessories: (each unit)
 - #606215 stainless steel skirt assembly.
 - Left and right end splashes.

ITEM #10: SOAP & TOWEL DISPENSER - - (N.I.K.E.C. - SPECIFIED BY ARCHITECT)

QUANTITY:	Five (5)
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ITEM #11: PREP SINK

QUANTITY:	One (1)
MANUFACTURER:	Custom Fabricated
MODEL NO:	#14 GA Stainless Steel
PERTINENT DATA:	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:

ITEM #11: (Continued)

1. Front and left end edge rolls per Detail 1.02B.
2. 13" high back and right end splash per Detail 1.04A. Attach backsplash to wall with fabricator-supplied z-clips.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. 5'-0" long table-mounted stainless steel overshef per Detail 1.12A.
6. Stainless steel undershef on both ends per Detail 1.11.
7. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
8. Accessories:
 - One (1) T&S #B-0231 backsplash-mounted swing spout faucet with #B-0199-01F-10 aerator.
 - Two (2) T&S #B-3950-01 twist waste valves with overflow assemblies and #010387-45 basket strainers.
9. 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 #12: WORKTABLE

QUANTITY:	Three (3)
MANUFACTURER:	Custom Fabricated
MODEL NO.:	#14 GA Stainless Steel
PERTINENT DATA:	6'-6" Long ± x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D:	----
ALTERNATE MFR:	None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07.
4. Stainless steel undershef per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of worktable with NSF-approved sound dampening material.

ITEM #12: (Continued)

8. Accessories:
-- One (1) Edlund #S-11C manual can opener installed on the Worktable to the left of Item #11, Prep Sink.

ITEM #13: WORKTABLE WITH SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 7'-6" Long \pm x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07. Flanged feet on each corner leg.
4. Stainless steel undershelf per Detail 1.11.
5. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.
6. Full-length table-mounted, dual-sided utensil rack with twenty (20) double-sided sliding stainless steel pot hooks per Detail 1.18B.
7. Worktable per Detail 2.01.
8. 18" x 18" x 10" deep utility sink per Detail 3.04 with stainless steel waste lever angle brackets fully welded to underside of sink.
9. Sound-deaden underside of tabletop and sink with NSF-approved sound dampening material.
10. Accessories:
-- One (1) T&S #B-0325 deck-mounted swing spout faucet with #B-199-2 aerator.

ITEM #14: RETRACTABLE CORD REEL

QUANTITY: Eight (8)
MANUFACTURER: APC Group Inc.
MODEL NO.: Kitchen Leash 12/3 20amp Breaker (N058)
PERTINENT DATA: Ceiling-Mounted, With Adjustable Stop, Non-GFI Receptacle
UTILITIES REQ'D: 20.0A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #14: (Continued)

1. Electrical Contractor to furnish and install GFCI type breaker at kitchen electrical panel board.

ITEM #15: UTILITY RACEWAY

QUANTITY:	One (1)
MANUFACTURER:	Captive-Aire Systems, Inc.
MODEL NO.:	UDW (N058)
PERTINENT DATA:	Wall-Mounted
UTILITIES REQ'D:	40.0A, 120/208V, 3PH; 225.0A, 480V, 3PH, 3/4"HW
ALTERNATE MFRS.:	Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K-101; Utility Raceway Details, Sheet K-502; Manufacturer's Shop Drawing and the following:

1. All components and labor necessary for a complete system manufactured in accordance with NEC latest edition, NEMA, NFPA No. 96 and No. 54, Uniform Plumbing Code, ASME, OSHA using only U.L. Listed certified components.
2. One (1) 15'-0" long, 12" wide x 6'-10" high with risers, completely pre-wired and pre-plumbed to one final connection point for electric, hot water and cold water. All connections shall face down on horizontal member.
3. System shall extend up to bottom edge of Ventilator, Item #16.
4. 54" overall height less risers with peaked top.
5. Risers on each end with 2" penetration into ventilator at 6'-8" A.F.F.
6. Entire raceway shall be constructed of #16 gauge Type 304 stainless steel with a #4 mill finish.
7. Removable link plates constructed of #16 gauge stainless steel.
8. Electrical compartment shall be completely enclosed with stainless steel housing accessible by the removal of link plates. Internal electrical feeder shall be cable busbar having balanced load and phases and with connection lugs for main service. Branch circuit wiring for each electrical connection shall be phase identified and sized in accordance with circuit breaker rated capacity. Raceway shall provide electrical and water service for items #17, #19, #20 and #21.
9. Provide 12" long interchangeable 16 gauge stainless steel link connection plate for each electrical connection wired to electrical load center in riser end with individual circuit breaker(s) and grounding type receptacle with twist-lock feature or pre-wired flexible sealtite conduit.
10. On each connection plate provide U.L. listed GFIC ground fault interrupter circuits and matching power supply cords on each 120-volt single-phase connection.
11. Hot water and cold water plumbing compartment shall be isolated from electrical compartment. All piping and disconnects in system shall be color coded.
12. Provide fire/fuel shut-off for electric equipment per NFPA No. 96. System shall require one final connection by Contractor from fire protection system.

ITEM #15: (Continued)

13. All hot and cold water piping, including individual branch pipe connection, shall be hard temper type "L" copper tubing with copper sweat type solder fittings. At each individual connection, provide A.G.A approved flexible hose(s) with two wall brass and stainless steel construction with quick-disconnect fittings.
14. Provide matching cord sets for all electric equipment, seven (7) total.
15. Neoprene bumper strips, full length.
16. U.L. listed, solid-state control panel mounted in right-hand riser end, with the following integral accessories:
 - Ventilator start/stop station with adjustable time-delay to exhaust residual heat.
 - Ventilator light switch, pre-wired in 10ft. flexible conduit ready for connection to light junction box in ventilator by Electrical Contractor.
17. Accessories:
 - Two (2) Everpure #EV9797-22 Kleen-Steam II twin water filter systems factory-installed and housed within left-hand riser. Provide two (2) independent pre-piped water lines to service points for Item #17: Convection Steamer and Item #20: Combi Oven. Fabricate 18"x18" lexan viewport in riser panel to monitor pressure gauge and filter bowl.
18. Fabricated in three (3) sections, assembled in field to present integral one-piece appearance.
19. Main electrical shunt-type circuit breakers mounted in left-hand riser for 40.0A, 120/208V, 3PH and 225.0A, 480V, 3PH services.
20. Factory System Design Verification (SDV) shall be performed after all inspections are complete. SDV report shall be available once completed.
21. Raceway shall be of same manufacturer as Ventilator, Item #16.

ITEM #16: VENTILATOR

QUANTITY:	One (1)
MANUFACTURER:	Captive-Aire Systems, Inc.
MODEL NO.:	7230VHB-G-REM1-PSP-F (N058)
PERTINENT DATA:	Wall-Mounted, Perforated Ceiling Make-up Air Plenum, Stainless Steel, Non-Grease, Heat/Vapor Removal Only Type
UTILITIES REQ'D:	2,333 CFM Exhaust/1,867 CFM Supply, 800W, 120V, 1PH (Lights)
ALTERNATE MFRS.:	Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K-101; Ventilator Detail Drawing, Sheet K-502 and Sheet K-503; Manufacturer's Shop Drawing and the following:

1. 6'-6" ± Wide x 15'-0" Long x 2'-6" High, with bottom edge mounted at 6'-8" A.F.F. Length comprised of one (1) 7'-6" long section on the left side and one (1) 5'-10" long section on the right side. Entire unit constructed of 18 GA, type 304 stainless steel #4 mill finish with liquid tight all welded external continuous seams and joints per N.F.P.A. 96, U.L. and State of Maryland Codes.
2. Five (5) U.L. Listed, NSF-Approved, 12"x12" recessed LED light fixtures, three (3) on the left and two (2) on the right side, equally spaced.

ITEM #16: (Continued)

3. Matching stainless steel perimeter closure panels to finished ceiling by K.E.C.; verify ceiling height.
4. Hanger rods and support system from structure above by other contract. K.E.C. to coordinate method and location with other trades.
5. Integral stainless steel hanger brackets.
6. 1" wide full-perimeter integral gutter with 1" turn-up and 3/4" stainless steel drain connection.
7. Full-length, front-mounted perforated stainless steel ceiling-mounted make-up air plenum with integral supply air balancing dampers for each hood section.
8. Integral 12" wide space at rear of Ventilator to accommodate Utility Raceway, Item #15.
9. Factory supervision of installation and start-up.
10. Accessories:
 - Field wrapper.
 - #18 gauge stainless steel wall flashing full length of hood to extend from top of finish floor coved base up to bottom edge of hood body. Attach to wall with non-exposed fasteners and seal with clear silicone sealant.
 - 12" utility cabinet at right with U.L. listed electrical pre-wire package #SC -1111 with light and fan switches.
11. Ventilator shall be of same manufacturer as Utility Raceway, Item #15.

ITEM #17: CONVECTION STEAMER

QUANTITY: One (1)
MANUFACTURER: AccuTemp Products, Inc.
MODEL NO.: E64803E140 DBL (N058)
PERTINENT DATA: (2) Double Stacked, Stand-Mounted 6-Pan, Connected Boilerless, Evolution Series
UTILITIES REQ'D: (2) 17.0A, 480V, 3PH; (2) 3/4" CW, (2) 3/4" IW
ALTERNATE MFRS.: Cleveland

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
 - #SNH-20-01 heavy-duty stainless steel support stand with adjustable bullet feet.
 - One (1) Everpure #EV9797-22 KleenSteam II Twin System Water Filter. Ship to Utility Raceway manufacturer for factory installation.
2. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #18: FLOOR TROUGH

QUANTITY: One (1)
MANUFACTURER: IMC Teddy Foodservice Corporation
MODEL NO.: ASFT-1824-SGAS (N058)
PERTINENT DATA: Anti-Spill, 14 GA S/S, Serrated Top, Anti-Slip Grating
UTILITIES REQ'D: 4" W
ALTERNATE MFRS.: None

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. 2'-0" long x 1'-6" wide, constructed and installed per Detail, Sheet K-102.
2. SGAS-18 anti-slip serrated stainless steel subway style removable floor grate in equal sections, the lessor of 30 lbs. and/or 20" long.
3. Bottom of trough pitched to integral stainless steel waste cup with removable perforated stainless steel basket.
4. Top of trough installed flush with top of kitchen finished floor.
5. Unit furnished by K.E.C.; installed by Plumbing Contractor.

ITEM #19: TILTING KETTLE, 20-GALLON

QUANTITY: One (1)
MANUFACTURER: Cleveland Range, Inc.
MODEL NO.: KET20T (N058)
PERTINENT DATA: Manual Tilting With 6" Stainless Steel Adjustable Legs, Self-Contained, 2/3 Steam Jacket Design
UTILITIES REQ'D: 15.8A, 480V, 3PH; ½" HW, ½" CW, 2" IW
ALTERNATE MFR.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
 - One (1) #VOK2 480-volt, 3-phase.
 - One (1) #KAK complete kettle accessory kit.
 - One (1) #CL20 lift-off cover.
 - One (1) #FS20 food strainer.
 - One (1) #LCH20 kettle lift-off cover holder.
 - One (1) #MS20 gallon measuring strip.
 - One (1) #DPK2 double pantry faucet with swing spout and bracket.
 - One (1) #316G1 316 stainless steel liner.
2. Electrical and mechanical services supplied through Utility Raceway, Item #15.

ITEM #20: COMBI OVEN

QUANTITY: One (1)
MANUFACTURER: Rational Cooking Systems, Inc.
MODEL NO.: SCC-62 E/SCC-102 E (N058)
PERTINENT DATA: Combi-Duo, Full Size, Self-Contained, SelfCooking Center® with Care Control
UTILITIES REQ'D: 22.1KW, 480V, 3PH; 37.0KW, 480V, 3PH; 3/4" CW, 2" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Three (3) years extended parts and labor warranty. All repairs to be performed by Rational factory certified service agents.
2. Accessories:
 - One (1) #60.71.932 Combi-Duo kit, stationary with 6" stainless steel legs with adjustable feet.
 - Twenty (20) #6019.1150 stainless steel 12" x 20" fry baskets.
 - Ten (10) #6010.2101 stainless steel 24" x 20" wire racks.
 - One (1) Everpure #EV9797-22 KleenSteam II Twin System Water Filter. Ship to Utility Raceway manufacturer for factory installation.
 - Rational Certified Installation.
 - Installation kit.
 - Chef Assistance Program.
 - One (1) bucket #56.00.210 cleaner tablets.
 - One (1) bucket #56.00.562 care tablets.
2. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #21: CONVECTION OVEN, MOBILE

QUANTITY: One (1)
MANUFACTURER: Blodgett Oven Company, Inc.
MODEL NO.: ZEPHAIRE-200-E DOUBLE (N058)
PERTINENT DATA: Double Section, Bakery Depth
UTILITIES REQ'D: (2) 11.0KW, 480V, 3PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
 - 480 volt/3PH operation.
 - Stainless steel front, both sides, top and solid back panels.
 - Four (4) heavy-duty 5" diameter polyurethane swivel casters, front two (2) with brakes.
2. Standard compliment of wire racks.
3. Electrical and mechanical services provided thru Utility Raceway, Item #15.

ITEM #22: PASS-THRU HEATED CABINET, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHF132WP-FHG/FHG (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Exterior/Interior, Glass Doors
UTILITIES REQ'D: 7.8A, 120/208V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-height glass doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. Universal tray slide assembly installed on 5" centers in lieu of wire shelves, five (5) pair per compartment, ten (10) pair total, each unit.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Cord and twist-lock type plug set with matching receptacle furnished and installed by Electrical Contractor.

ITEM #23: PASS-THRU REFRIGERATOR, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Traulsen & Co., Inc.
MODEL NO.: RHT132WPUT-FHG/FHG (N058)
PERTINENT DATA: One-Section, Self-Contained, Stainless Steel Interior/Exterior, Glass Doors
UTILITIES REQ'D: 7.2A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-height glass doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. No. 1 - #16 gauge stainless steel, angle type, bottom support tray slides for 18" x 26" sheet pans in lieu of wire shelves installed on 3" centers, nine (9) pair per compartment, eighteen (18) total, each unit.
4. Exterior mounted digital thermometer installed on kitchen side.
5. Four (4) heavy-duty swivel casters, all four (4) with brakes.
6. Cord and plug set.

ITEM #24: HOT TRANSPORT CABINET, MOBILE

QUANTITY: Two (2)
MANUFACTURER: CresCor
MODEL NO.: 1000-HH-SS-2DE (N058)
PERTINENT DATA: Two Compartment, Insulated, (16) 12" X 20" Pan Capacity, Stainless Steel Construction
UTILITIES REQ'D: 15.0A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories: (for each unit)
 - Full-perimeter wrap-around non-marking vinyl bumper.
 - Polyurethane casters, two (2) with brakes.
2. Cord and plug set.

ITEM #25: REACH-IN REFRIGERATOR, MOBILE

QUANTITY: One (1)
MANUFACTURER: Traulsen & Company, Inc.
MODEL NO.: RHT232NUT-HHS (N058)
PERTINENT DATA: Two-Section, Self-Contained, Stainless Steel Interior/Exterior
UTILITIES REQ'D: 8.2A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Half-height solid doors hinged per Equipment Plan.
2. Cylinder door locks, keyed-alike.
3. Standard sealed wire shelves; furnish three (3) extra per section, twelve (12) total.
4. Exterior mounted digital thermometer.
5. 5" diameter heavy-duty swivel casters, front two (2) with brakes.
6. Cord and plug set.

ITEM #26: ICE MACHINE/BIN

QUANTITY: One (1)
MANUFACTURER: Hoshizaki America Inc.
MODEL NO.: KM-350MAJ/B-300SF (N058)
PERTINENT DATA: Air-Cooled, 489-Lb. Maker, 300-Lb. Bin, Crescent Cube, Energy Star
UTILITIES REQ'D: 9.05A, 120V, 1PH; 1/2" CW, 3/4" IW
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

ITEM #26: (Continued)

1. Stainless steel exterior finish, ice machine and bin.
2. Accessories:
 - One (1) Everpure #EV9324-21 InsurIce i2000² Single water filter system with Everpure #EV9534-26 Coarse Filter, mounted on manufacturer's common wall bracket.
 - 6" high stainless steel legs with adjustable bullet feet.
 - Custom fabricated stainless steel ice scoop holder mounted to right-hand side of bin per Detail, Sheet K-501.
3. Backflow prevention device installed on incoming water line by Plumbing Contractor.
4. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #27: SERVING COUNTER, MOBILE

QUANTITY:	Three (3)
MANUFACTURER:	Shelleysteel by The Delfield Company
MODEL NO.:	Modular Stainless Steel Interlocking Sections (N058)
PERTINENT DATA:	L-Shaped Configuration, #14 GA Stainless Steel Tops, All-Steel Construction With Laminated Panels
UTILITIES REQ'D:	----
ALTERNATE MFR.:	SpecLine by Low-Temp Industries

Refer to individual counter components listed under alpha headings for specification.

ITEM #27A: HOT FOOD COUNTER, MOBILE

QUANTITY:	Three (3)
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.:	SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide full-length solid stainless steel tray slide with mitered end mounted on rigid brackets @ 29" A.F.F. Extend tray slide to span length of Item #27B: Solid Top Counter and interlock with Frost Top Counter.
2. (E) - 8" wide, full-length solid stainless steel fold-down work shelf on server's side.
3. FlexiShield® #DCFSFS full-length adjustable food shields with stainless steel finish uprights, radiant heat lamp and LED lights with shatterproof shield and on/off switch.
4. (F) - Line-up interlocks for counter body and tray slide.
5. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.

ITEM #27A: (Continued)

6. Cord and plug set. Double cord hooks on bottom of unit.
7. (P) - Open understorage with bottom stainless steel shelf.
8. (QQ) – Food wells with individual drains and quarter-turn ball valves plumbed to isolated manifold assembly with master shut-off valve within counter base on end opposite Item #27B with stainless steel hinged access door per Detail Sheet K-103.
9. Standard counter height of 36" A.F.F. Turn both end down to align and interlock with adjacent solid top counter.
10. Exterior body color as selected by Architect; K.E.C. to verify.
11. Accessories: (each unit)
 - T&S #B-0205LN deck-mounted single pantry fill faucet with #B-0208 swivel nozzle mounted on end opposite solid top counter.
 - Fifteen (15) Vollrath #19196 stainless steel angled adapter plate.

ITEM #27B: CORNER SOLID TOP COUNTER, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SC-60-NU-MOD (N058)
PERTINENT DATA: Open Base, 60" Long
UTILITIES REQ'D: ----
ALTERNATE MFR.: SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (F) - Line-up interlocks for counter body.
2. Open understorage with bottom and intermediate stainless steel shelf.
3. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
4. Modified counter height of 30" A.F.F.
5. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #27C: FROST TOP COUNTER, MOBILE

QUANTITY: Three (3)
MANUFACTURER: Shelleysteel by The Delfield Company
MODEL NO.: SCFT-60-NU-MOD (N058)
PERTINENT DATA: Mechanically Refrigerated Frost Top, Open Base
UTILITIES REQ'D: 7.0A, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.: SpecLine by Low-Temp Industries

ITEM #27C: (Continued)

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide solid stainless steel tray slide with mitered end mounted on rigid brackets @ 29" A.F.F.
2. FlexiShield® #DCFSFS full-length adjustable food shields with stainless steel finish uprights, LED lights with shatterproof shield and on/off switch.
3. (F) - Line-up interlocks for counter body and tray slide.
4. Cord and plug set. Double cord hooks on bottom of unit.
5. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
6. (P) - Open understorage with bottom stainless steel shelf.
7. Modified counter height of 30" A.F.F.
8. Provide drain line less shut-off valve. Plumber to extend copper drain line to nearest floor sink.
9. Provide two-piece removable washable frost top grate in equal sections.
10. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #27D: CASHIER'S STAND, MOBILE

QUANTITY:	Three (3)
MANUFACTURER:	Shelleysteel by The Delfield Company
MODEL NO.:	SCS-30-MOD (N058)
PERTINENT DATA:	30" Long x 30" Wide
UTILITIES REQ'D:	15A, 120V, 1PH (Dedicated Service)
ALTERNATE MFRS.:	SpecLine by Low-Temp Industries

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (B) - 10" wide solid stainless steel tray slide mounted on rigid brackets @ 29" A.F.F.
2. (F) - Line-up interlocks for counter body and tray slide.
3. (Q) – One (1) duplex receptacle mounted in counter base. Provide die-raised opening in top for power cord access.
4. (V) - 5" diameter heavy-duty swivel casters, all (4) with brakes. Provide stainless steel caster cradle, Eagle Group #CC-S-2, for each caster, to allow for consistent equipment placement.
5. Utility drawer assembly with locking provision mounted on end.
6. Cord and plug set. Double cord hooks on bottom of unit.

ITEM #27D: (Continued)

7. Standard counter working height of 36" A.F.F. Turn end down to align and interlock with adjacent Frost Top Counter.
8. Exterior body color as selected by Architect; K.E.C. to verify.

ITEM #28: CASH REGISTER - - (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Three (3)

ITEM #29: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: SMF49HC-1-S
PERTINENT DATA: 49" Wide, Single Access, 12-Case Capacity, Forced-Air Type, R290
Hydrocarbon Refrigerant
UTILITIES REQ'D: 3A, 120V, 1PH
ALTERNATE MFRS.: Continental; True

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Stainless steel exterior and interior.
2. Cord and plug set.
3. Cylinder lid lock.
4. Swivel casters with brakes.
5. Accessories:
-- #00C01-012A-01 corner bumper kit.

ITEM #29A: MILK COOLER, MOBILE

QUANTITY: One (1)
MANUFACTURER: Beverage-Air
MODEL NO.: STF49HC1-S (N058)
PERTINENT DATA: 49" Wide, Dual Access, 12-Case Capacity, Forced-Air Type, R290
Hydrocarbon Refrigerant
UTILITIES REQ'D: 3.3A, 120V, 1PH
ALTERNATE MFRS.: Continental/OOLP; True

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Stainless steel exterior and interior.
2. Cord and plug set.
3. Cylinder lid lock.

ITEM #29A: (Continued)

4. Swivel casters with brakes.
5. Accessories:
 - #00C01-012A-01 corner bumper kit.

ITEM #30: ICE CREAM CABINET, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Nor-Lake
MODEL NO.: FTB31-6 (N058)
PERTINENT DATA: 7.4 Cu. Ft. Capacity, Stainless Steel Top, White Painted Cabinet, Sliding Glass Lids With Lock & Keys
UTILITIES REQ'D: 1.1A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Cord and plug set.

ITEM #31: ELECTRONIC MENU BOARD -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Three (3)

Furnished by Owner and installed by K.E.C. per Equipment Plan, Sheet K-101 and Manufacturer's Instructions.

ITEM #32: PAN RACK CART, MOBILE

QUANTITY: Three (3)
MANUFACTURER: CresCor
MODEL NO.: 207-1820 (N058)
PERTINENT DATA: Fixed Angles, (20) 18x26 Pan Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Lakeside, InterMetro

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Full-perimeter wrap-around non-marking vinyl bumper.

ITEM #33: POT WASHING SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 10'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: (2) 3/4" HW, (2) 3/4" CW, (3) 2" IW"
ALTERNATE MFRS.: None

ITEM #33: (Continued)

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501 and the following:

1. Front and end edge rolls per Detail 1.02B.
2. 13" high back, left and partial right end splash per Detail 1.04B.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Stainless steel undershelf on both ends per Detail 1.11.
7. Full-length table-mounted stainless steel overshelf per Detail 1.12A.
8. Pot sink and drainboards per Detail 3.01.
9. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
10. Accessories:
 - Two (2) T&S #B-0290 backsplash-mounted swing spout faucets.
 - Three (3) T&S #B-3950-01 twist handle drains with rear-connected over-flows, handle bracket and basket strainer.
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 #34: TRASH CONTAINER, MOBILE

QUANTITY:	Three (3)
MANUFACTURER:	Rubbermaid Commercial Products, Inc.
MODEL NO.:	FG263200GRAY (N058)
PERTINENT DATA:	32-Gallon Capacity
UTILITIES REQ'D:	----
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Gray in color.
2. Accessories: (each unit)
 - One (1) #FG264000BLA conversion dolly.
 - One (1) #FG263100GRAY matching flat lid.

ITEM #35: SOILED DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 10'-0" x 6'-6" Long \pm x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front edge roll per Detail 1.02B.
2. 13" high back and right end splash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Soiled dishtable per Detail 2.02.
7. Provide stainless steel crossrails under pass-thru window for storage of 20" x 20" dish/glass racks.
8. 20" wide x 8" deep integral pre-rinse sink with one-piece removable #20 gauge perforated stainless steel scrap basket with 1" diameter fully welded tubular cross-rails set flush with tabletop.
9. Sound-deaden underside of sink and drainboard with NSF-approved sound dampening material.
10. Accessories:
 - One (1) Component Hardware #D63-4161 box pattern drain assembly welded to underside of pre-rinse sink.

ITEM #36: 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 #37: 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. Right-to-left operation.
8. Vent fan control.
9. Accessories:
 - Two (2) #EXTHD 4"x16" extended vent hoods with locking damper.
 - Two (2) #SHTPAN-RACK open-end 20"x20" racks for 18"x26" sheet pans.
 - Six (6) #DISHRAK-PEG20 peg-type, and four (4) #DISHRAK-COM20 combination-type 20"x20" plastic racks
 - Two (2) stainless steel splash shields.
 - One (1) #DTV-CLEN drain water tempering kit.
 - One (1) #ERH30K 30KW built-in booster heater.
 - One (1) #CLE/TBL-SWITCH table limit switch.
 - One (1) #1/2INSHK-ABSRBR water hammer arrestor kit.
 - One (1) #SPCYES single-point electrical connection.
 - One (1) #HTG6HI stainless steel frame with 6" extended height chamber.

ITEM #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

Fabricate and install per Equipment Plan, Sheet K-101; and the following:

ITEM #38: (Continued)

1. Constructed and installed per Detail 5.06.

ITEM #39: CLEAN DISHTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 6'-0" Long x 2'-6" Wide x 2'-10" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front and left end edge roll per Detail 1.02B.
2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
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 #37) in end of dishtable, interwired by Electrical Contractor.

ITEM #40: POT & PAN SHELIVING, MOBILE

QUANTITY: Two (2)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax i (N058)
PERTINENT DATA: Open Grid Shelf, Polymer
UTILITIES REQ'D: ----
ALTERNATE MFR.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Two (2) #MX2448G sections; 24" W x 48" L x 4-tier high.
2. Eight (8) #MX63UP polymer posts for stem casters, 61-3/16" high.
3. Four (4) #5MPX polyurethane swivel casters with donut bumpers.
4. Four (4) #5MPBX polyurethane casters with brakes and donut bumpers.

ITEM #40: (Continued)

5. Plastic wedge lock connectors, quantity as required.
6. Locate bottom shelf @ 18" A.F.F., space remaining shelves equally.
7. Accessories (each unit):
 - One (1) #MTR2448XE tray drying rack.
 - Five (5) #MXD24-8 shelf dividers.

ITEM #41: WASHER

QUANTITY:	One (1)
MANUFACTURER:	Electrolux
MODEL NO.:	EFLS517S TT/IW (N058)
PERTINENT DATA:	27" Electric Front Load, 4.3 Cu. Ft. Capacity, Island White
UTILITIES REQ'D:	12.0A, 120V, 1PH, 3/4" HW, 3/4" CW, 1-1/4" IW
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #42: DRYER

QUANTITY:	One (1)
MANUFACTURER:	Electrolux
MODEL NO.:	EFDE317TIW (N058)
PERTINENT DATA:	27" Electric Front Load, 8.0 Cu. Ft. Capacity, Island White
UTILITIES REQ'D:	30.0A, 208V, 1PH, 3/4" HW, 3/4" CW, 1-1/4" IW
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.

ITEM #43: MOP SINK & RACK -- (N.I.K.E.C. – SPECIFIED BY MECHANICAL & ARCHITECT)

QUANTITY:	One (1)
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ITEM #44: SHELVING

QUANTITY:	One (1)
MANUFACTURER:	InterMetro Industries Corporation
MODEL NO.:	MetroMaxQ (N058)
PERTINENT DATA:	Free-Standing, Polymer
UTILITIES REQ'D:	----
ALTERNATE MFRS.:	None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

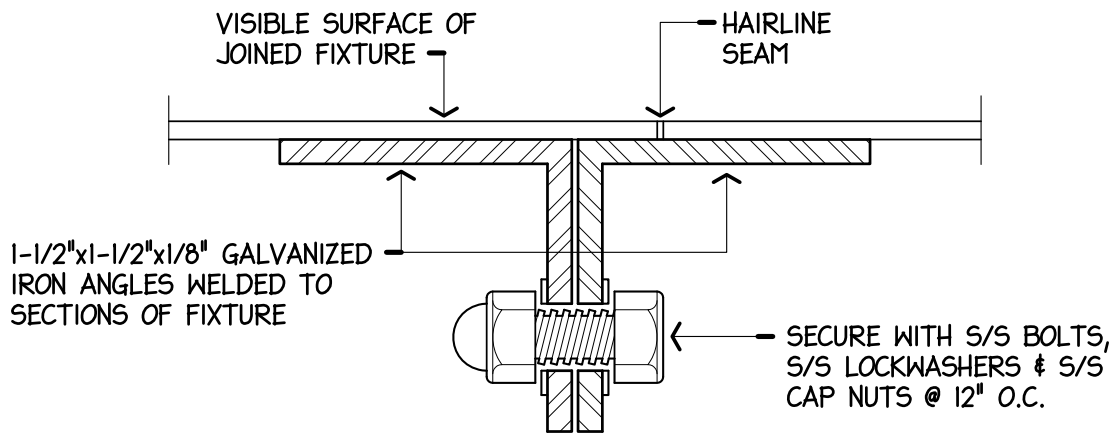
ITEM #44: (Continued)

Dry Storage:

1. One (1) #MQ1836G section; 18" W x 36" L x 4-tier high.
2. Four (4) #MX63UP polymer posts for stem casters, 61-3/16" high.
3. Two (2) #5MPX polyurethane swivel casters with bumpers.
4. Two (2) #5MPBX polyurethane swivel casters with brakes and bumpers.
5. Plastic wedge lock connectors, quantity as required.
6. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

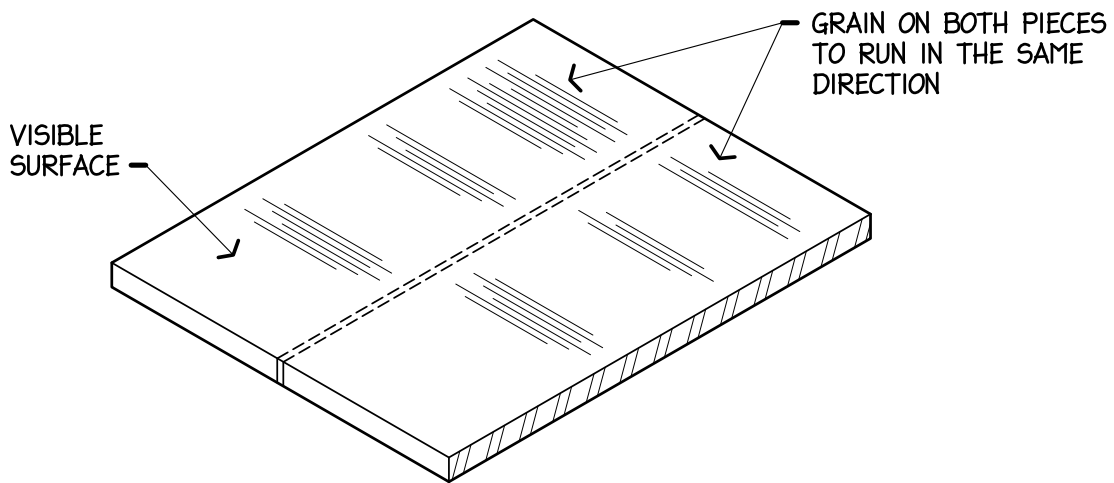
(END OF FOODSERVICE ITEMIZED SPECIFICATIONS)

STANDARD DETAILS



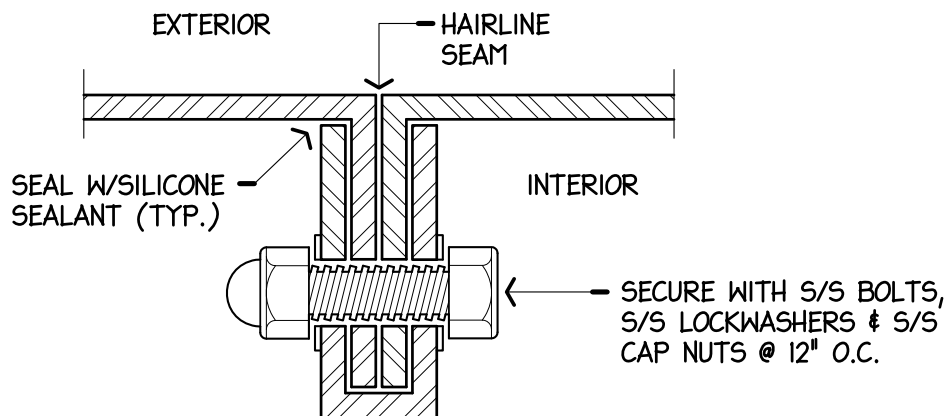
NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT



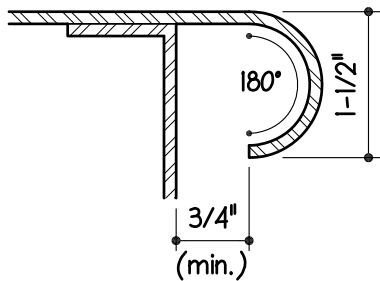
NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT

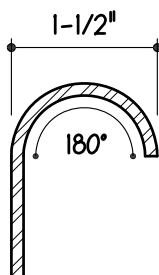


NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

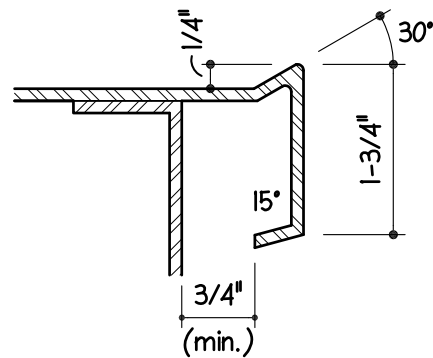
C. RAISED CAP SEAM - KNUCKLE JOINT



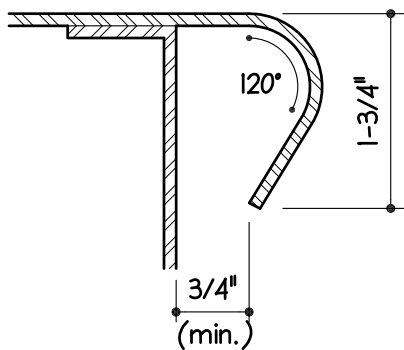
ROLLED A.



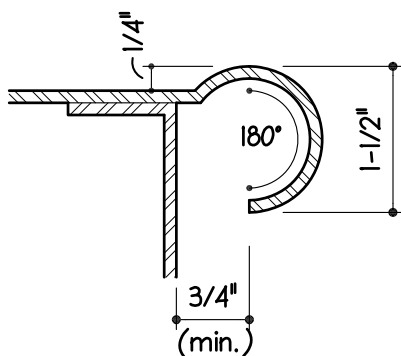
RAISED ROLLED B.



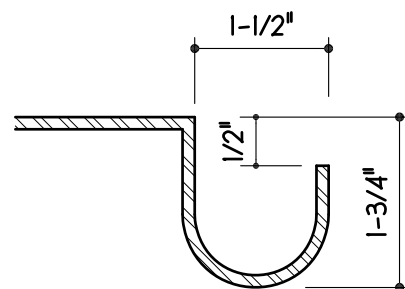
INVERTED "V" EDGE C.



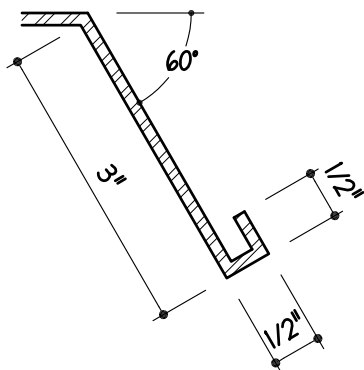
BULL NOSE ROLLED D.



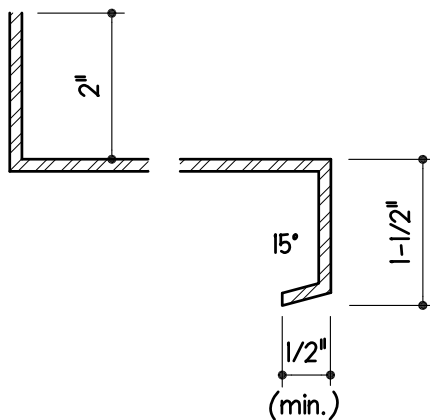
MARINE EDGE E.



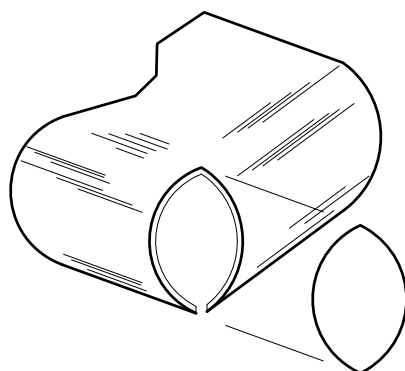
FLOUR GUTTER F.



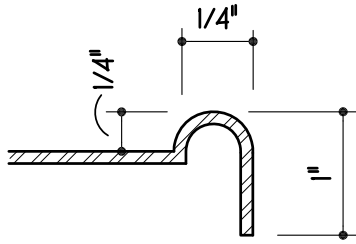
RECIPE CARD HOLDER G.



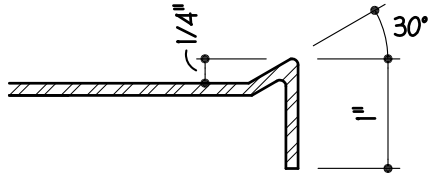
UNDERSHELF EDGE H.



BULL NOSE CORNER I.

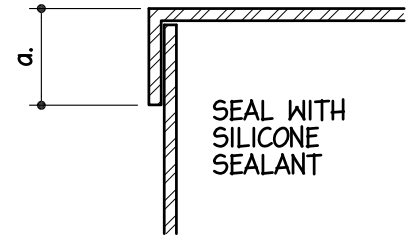


RAISED OPENING EDGE J.

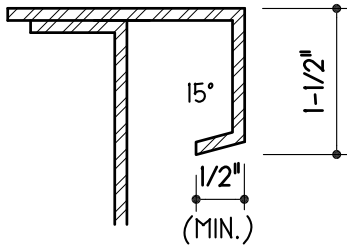


RAISED OPENING EDGE K.

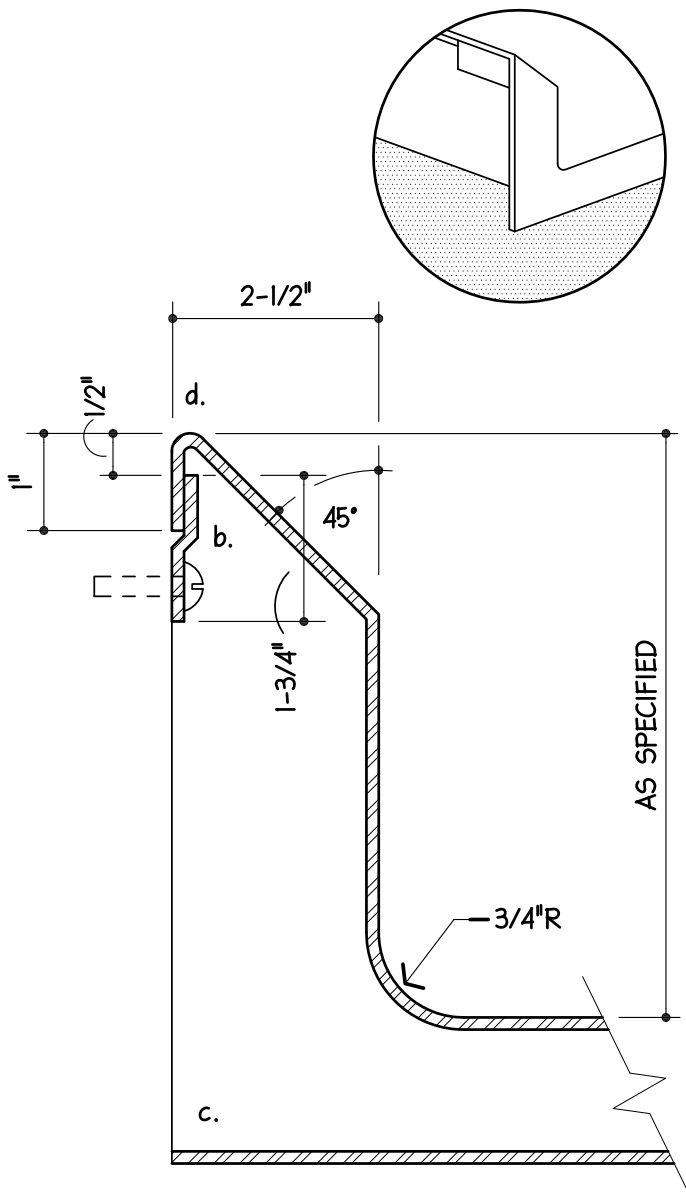
a. AS SPECIFIED. TO
MATCH ADJACENT
ROLLED EDGES



STRAIGHT TURN DOWN L.



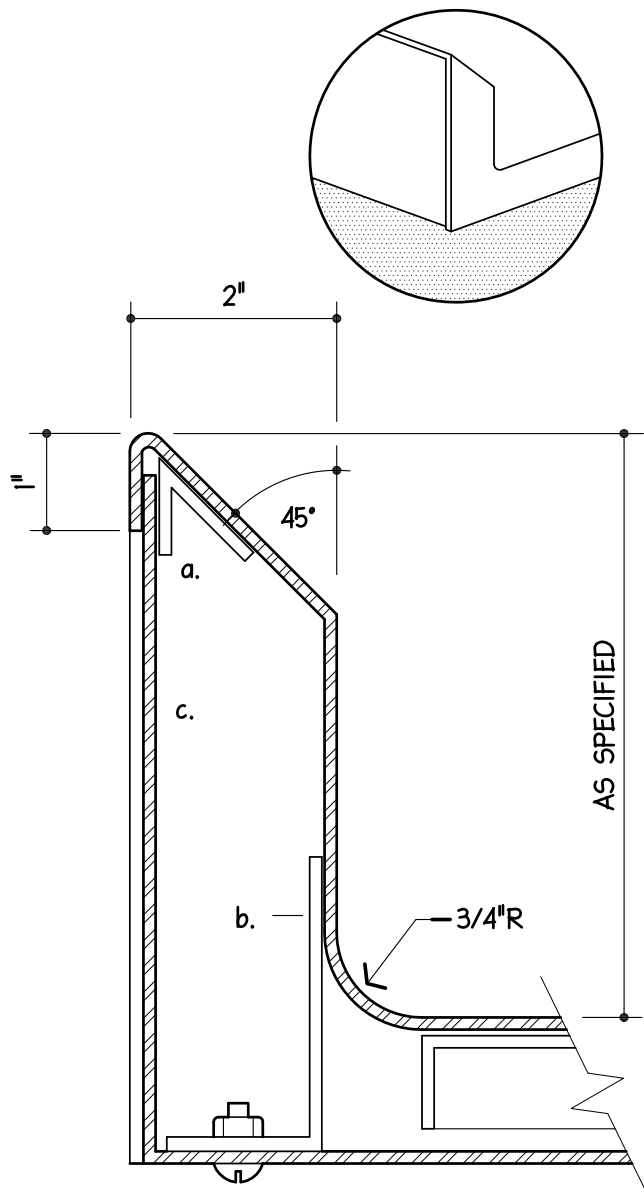
TURNED DOWN EDGE M.



WALL UNIT

DETAIL A

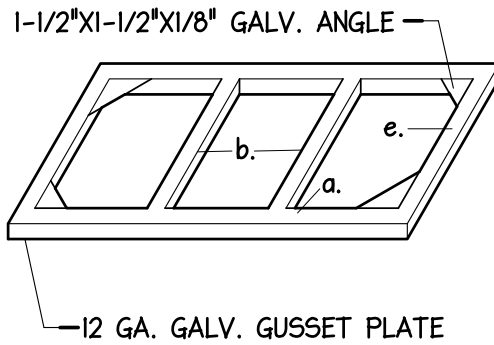
- a. 2-1/2" AT SINK TO ALLOW FOR CONNECTED OVERFLOW
- b. 12 GA. S/S CLIPS, 4" LONG, FASTENED TO EACH WALL END OF EACH UNIT & 4'-0" ON CENTER. SECURE TO WALL W/A MINIMUM OF TWO 1/4"x20 S/S TOGGLE BOLTS OR EXPANSION SHIELDS.
- c. EXPOSED ENDS TO BE FULLY WELDED CLOSED.
- d. SEAL ALL AROUND TO WALL WITH SILICONE SEALANT.



FREE STANDING UNIT

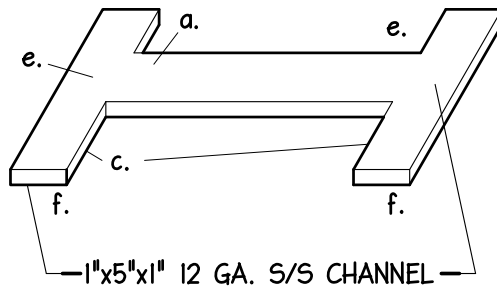
DETAIL B

- a. 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.
- b. 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.
- c. 14 GA S/S PANEL SECURED TO CLIPS W/ S/S OVALHEAD BOLT. WELD NUT TO CLIP.
- d. EXPOSED ENDS TO BE FULLY WELDED.



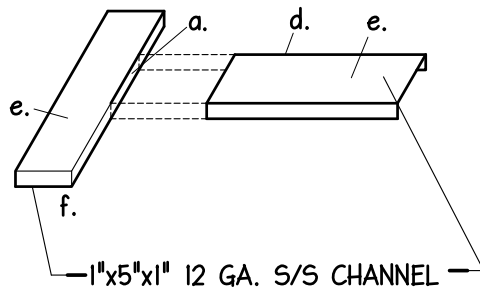
TABLES

A.



DISHTABLES

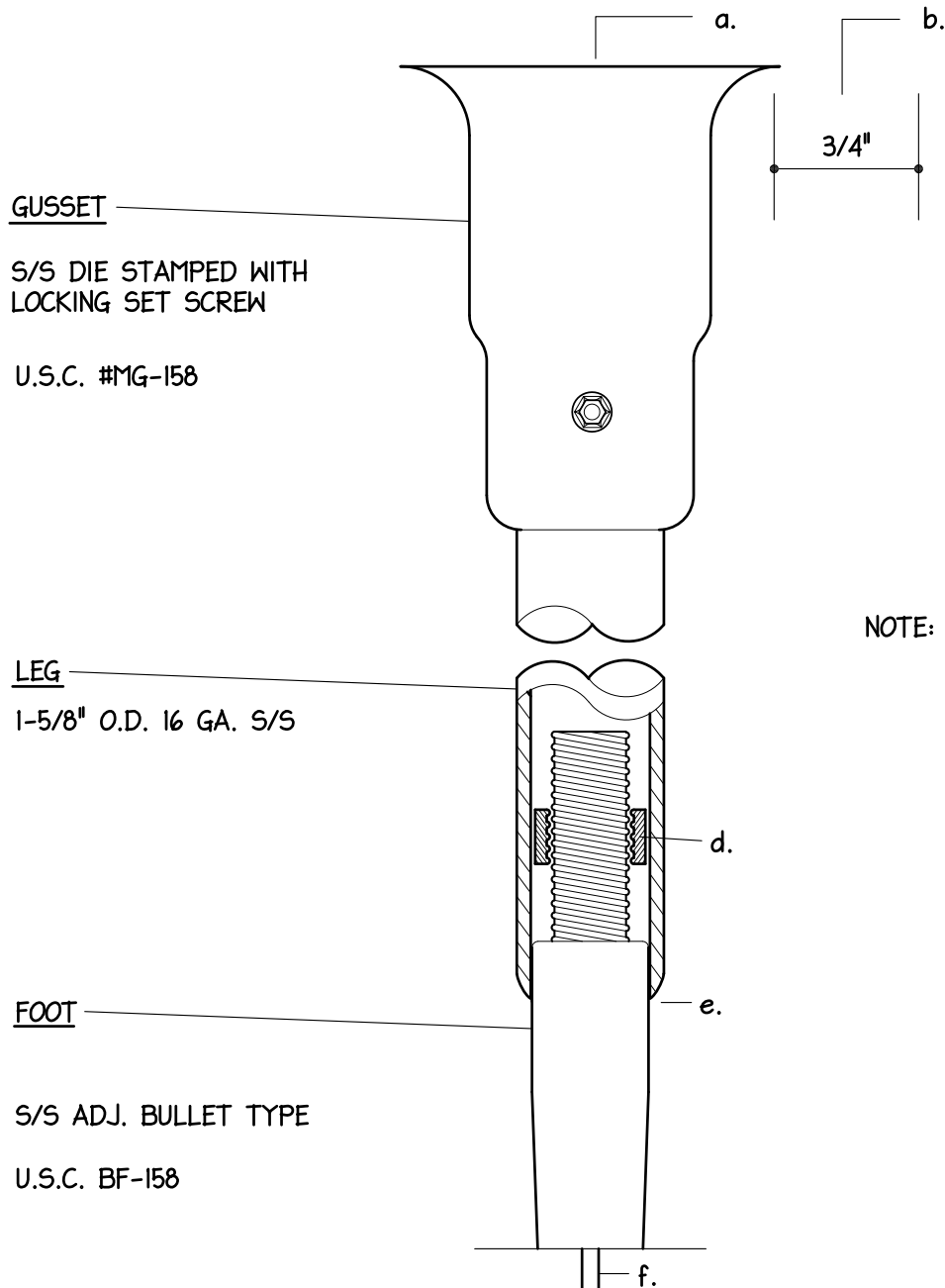
B.



SINK DRAINBOARDS

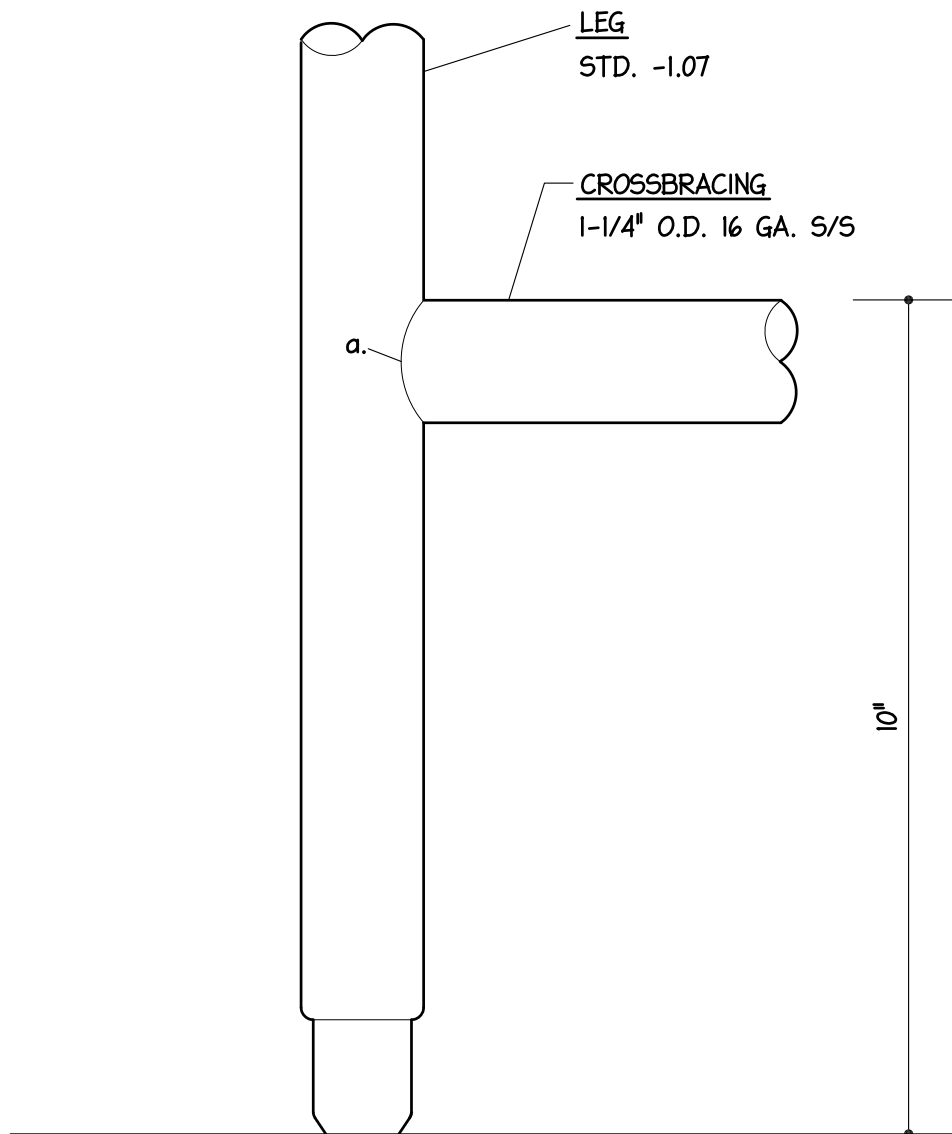
C.

- 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.

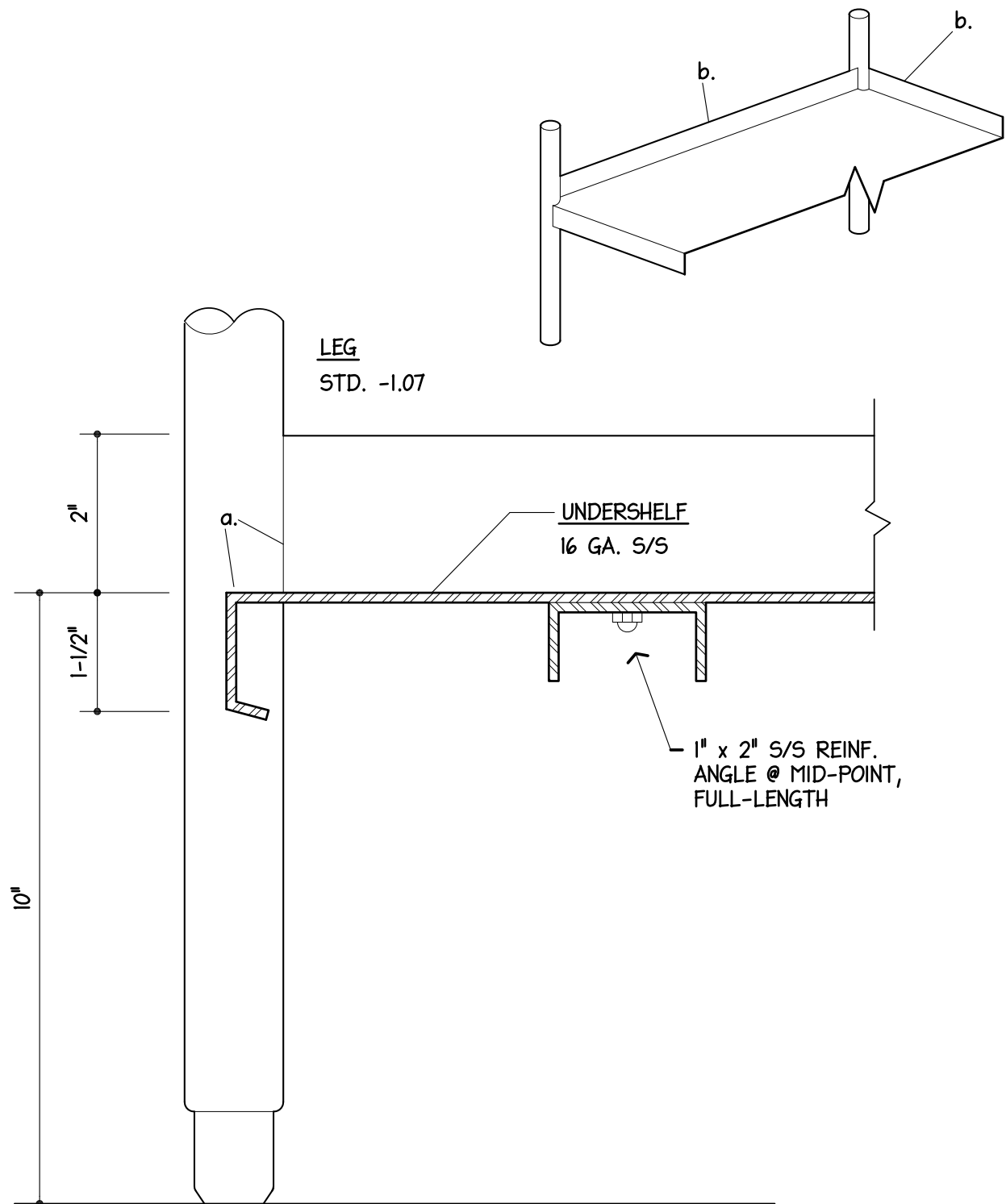


NOTE: ENTIRE FINISHED
STRUCTURE AND
INDIVIDUAL COMPONENTS
TO MEET NSF
REQUIREMENTS

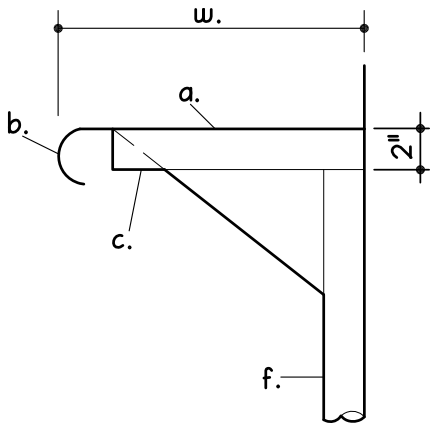
- a. FULLY WELD GUSSET TO FRAMEWORK OR SINK
- b. 3/4" MINIMUM CLEARANCE ALL AROUND
- c. SET SCREW NOT VISIBLE TO WORKING SIDE OF EQUIPMENT.
- d. MAXIMUM 1/32" CLEARANCE BETWEEN LEG AND FOOT
- e. FOOT SET AT MIDPOINT TO ALLOW 1" ADJUSTMENT UP AND 1" DOWN.
WITHOUT THREAD EXPOSURE.
- f. LEGS UNSUPPORTED 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.



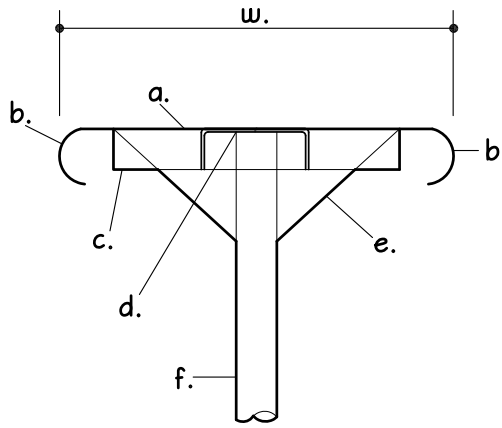
a. FULLY WELD, GRIND SMOOTH AND POLISH.



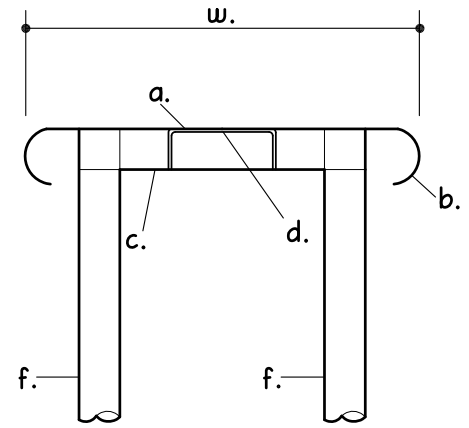
- a. FULLY WELD, GRIND SMOOTH AND POLISH.
- b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2".



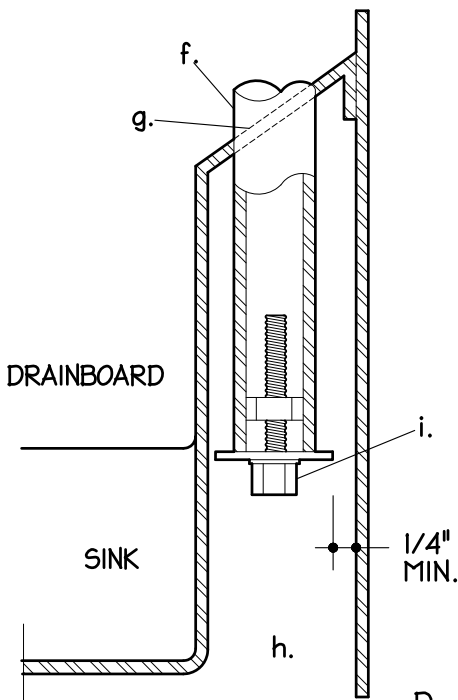
A.



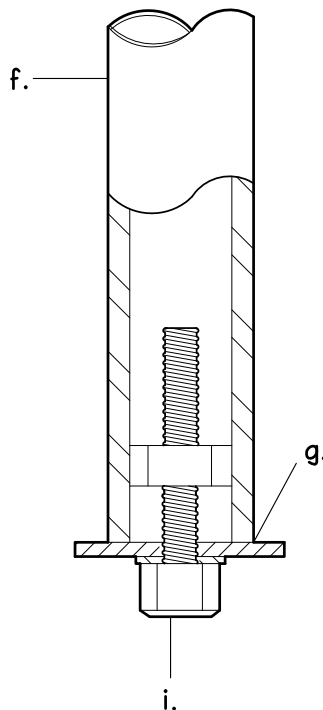
B.



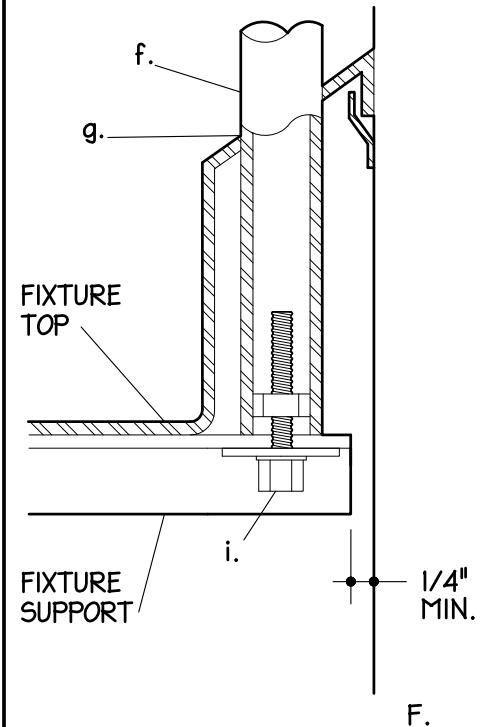
C.



D.

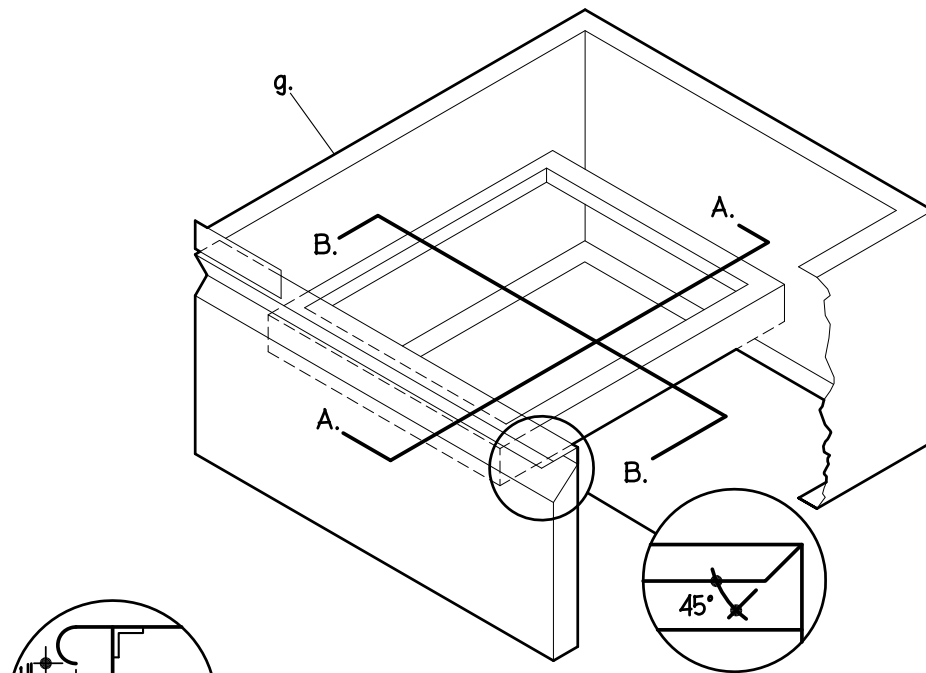


E.

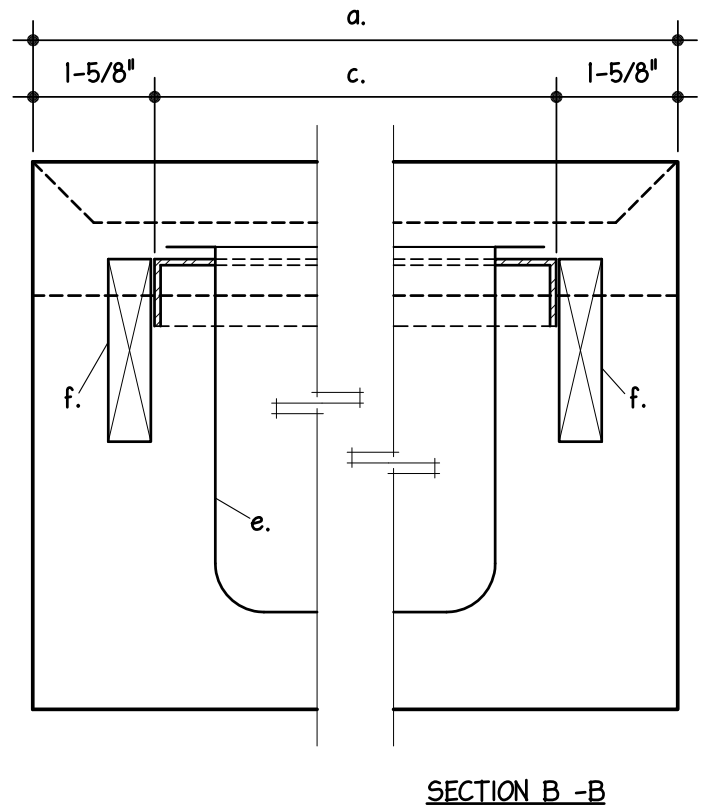
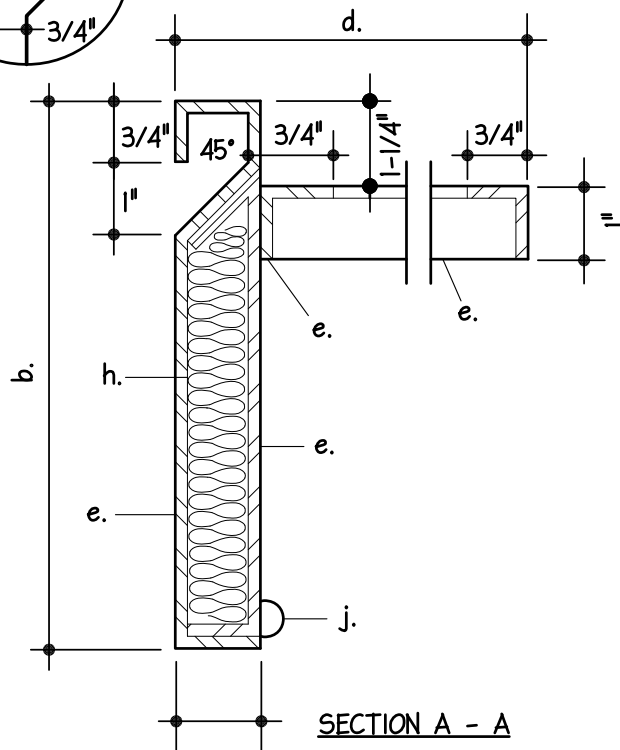
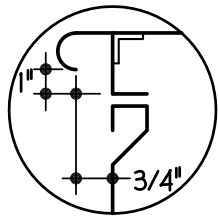


F.

- a. 16 GA S/S SHELF
- b. STD.- 1.02 EDGE
- c. 1"x 3"x 1" 14 GA. S/S CROSS CHANEL
- d. 1"x 3"x 1" 14 GA. S/S LENGTHWISE CHANNEL WHEN LENGTH BETWEEN SUPPORTS EXCEEDS 42"
- e. 14 GA. S/S BRACKETS FULLY WELDED TO SUPPORT AND CHANNEL..
- f. 1-1/4" O.D. 16 GA. S/S UPRIGHT. MAXIMUM 5'-0" ON CENTER.
- g. TIGHT FIT. SEAL WITH SILICONE SEALANT.
- h. 1-1/2"x 1-1/2" 12 GA. S/S CLIPS WELDED TO REAR OF SPLASH AT DRAINBOARD HEIGHT.
- i. 3/8"x 16 S.S. HEX HEAD BOLT, S/S NUT & S/S LOCKWASHER. NUT WELDED IN TUBE.
- w. WIDTH AS SPECIFIED.

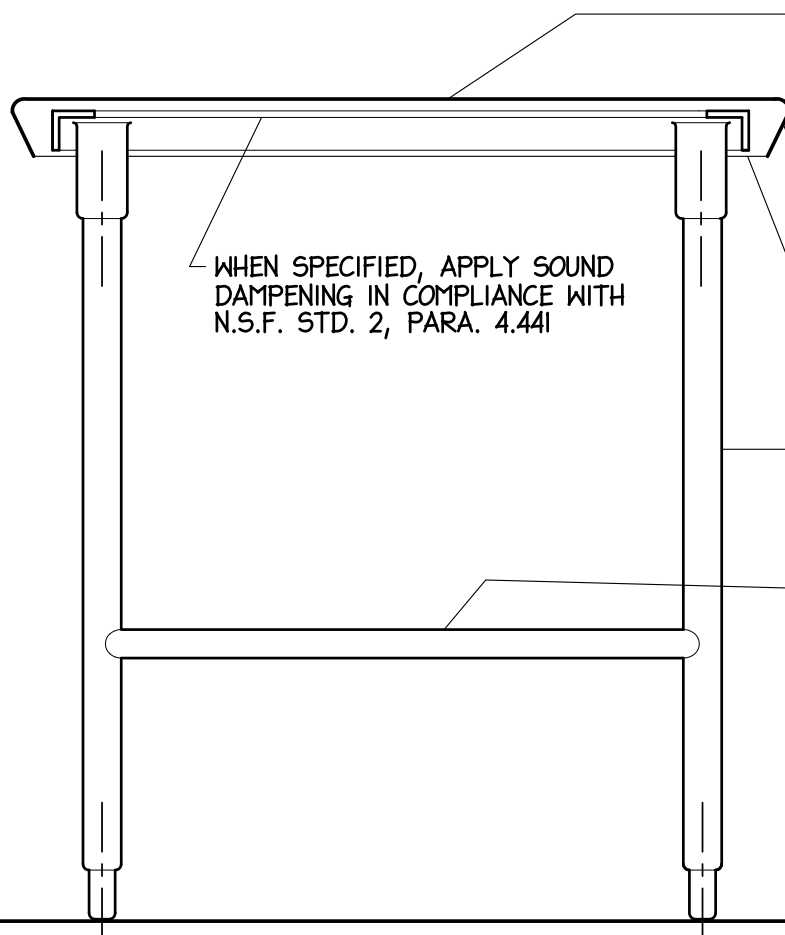
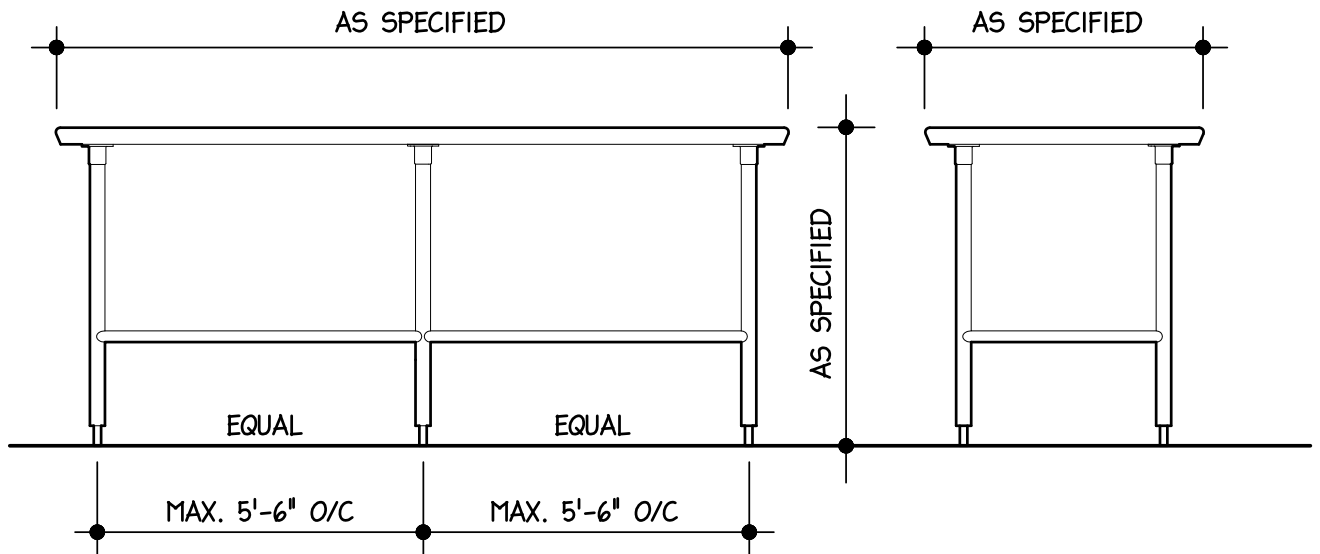


- e. 16 GA. S/S ALL WELDED.
- f. 3 PIECE SELF CLOSING DWR. SLIDE AS MFD. BY COMPONENT HARDWARE, S52 SERIES WITH S/S ROLLER BEARINGS. PITCH SLIDE DOWNWARD 3/8" PER FOOT FOR SELF-CLOSING ACTION.
- g. 18 GA. S/S DWR. ENCLOSURE. ALL WELDED.
- h. SEMI - RIGID FIBERGLASS SOUND DAMPENING.
- j. HARD RUBBER DRAWER BUMPER EACH CORNER.



i. PROVIDE DIE - STAMPED #18 GA. S/S DWR. PANS AS FOLLOWS:

TYPE	NO.	PANS	a.	b.	c.	d.
I	1	20x20x5 DP.	25	7-1/2	21-3/4	22-3/4
II	1	20x20x8 DP.	25	10-1/2	21-3/4	22-3/4
III	1	12x20x4 DP.	25	6-1/2	21-3/4	14-1/2
IV	2	12x20x4 DP.	28	6-1/2	26-1/4	22-1/2
V	1	12x20x4 DP.	17	13-1/2	13-1/2	22-1/2



TOP

14 GA. S/S SECURED TO FRAME WITH WELD STUDS, S/S LOCKWASHERS AND CAP NUTS.

EDGE

STD. - 1.02 AS SPECIFIED.

FRAMEWORK

STD. - 1.07

LEGS

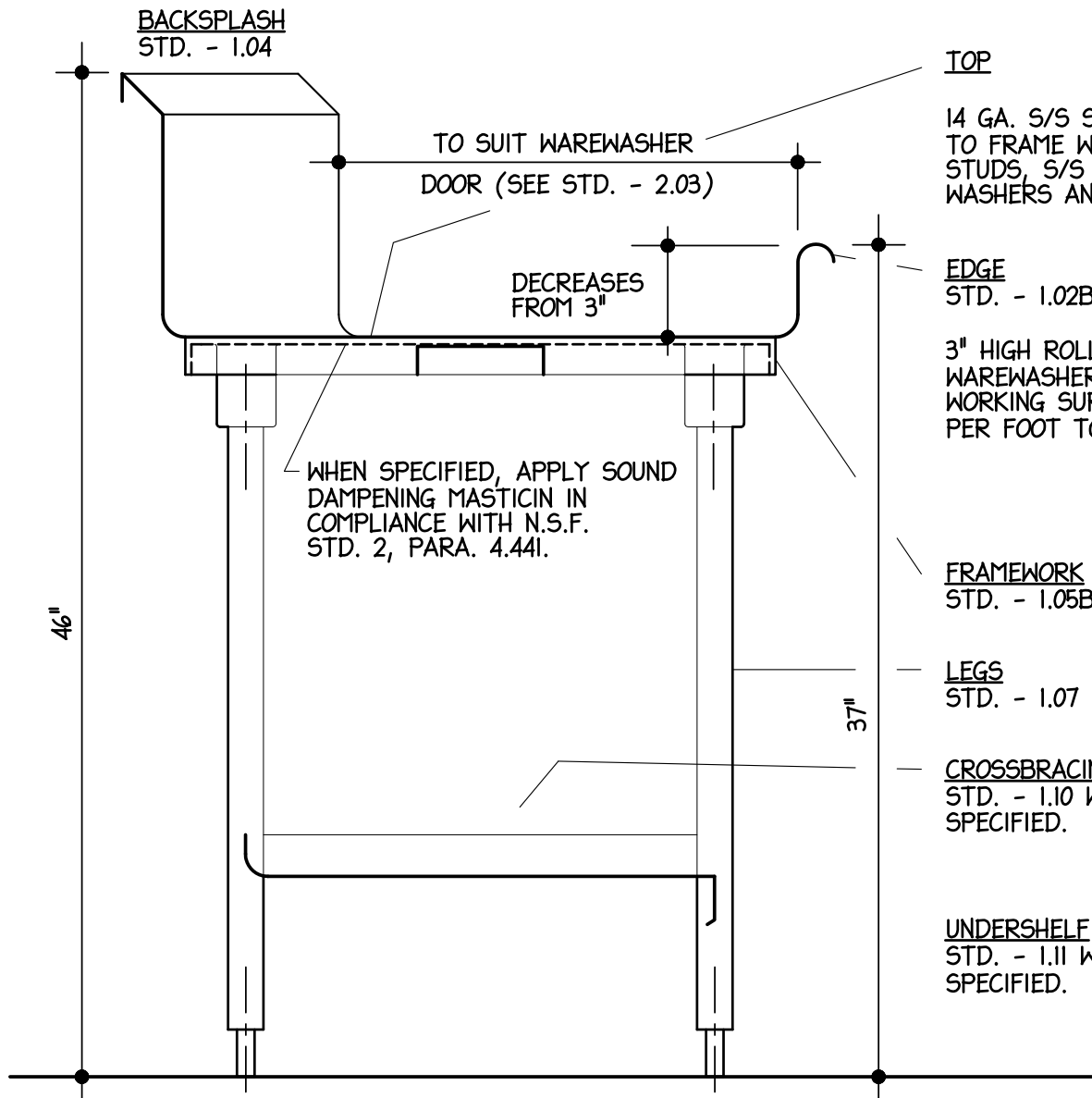
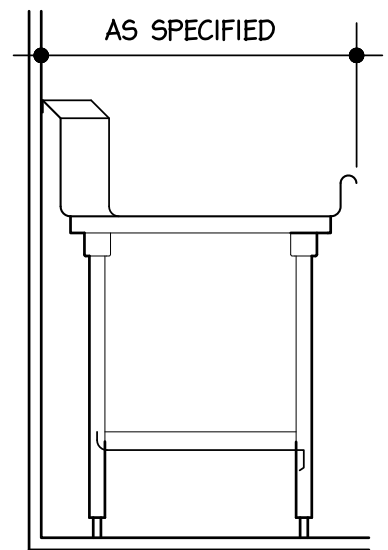
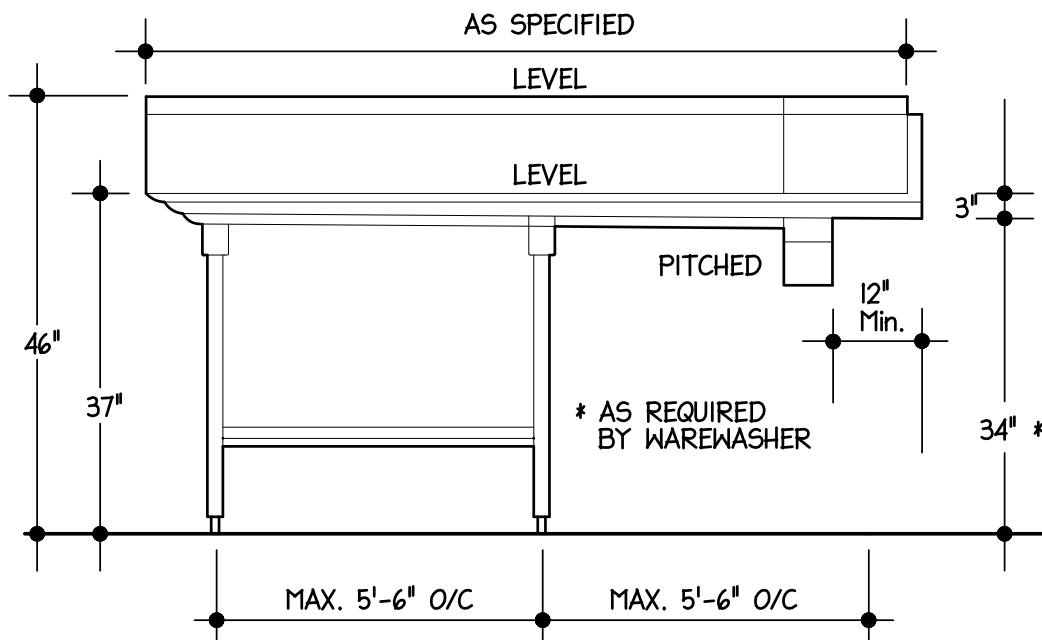
STD. - 1.07

CROSSBRACING

STD. - 1.10 WHEN SPECIFIED.

UNDERSHELF

STD. - 1.11 WHEN SPECIFIED.



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

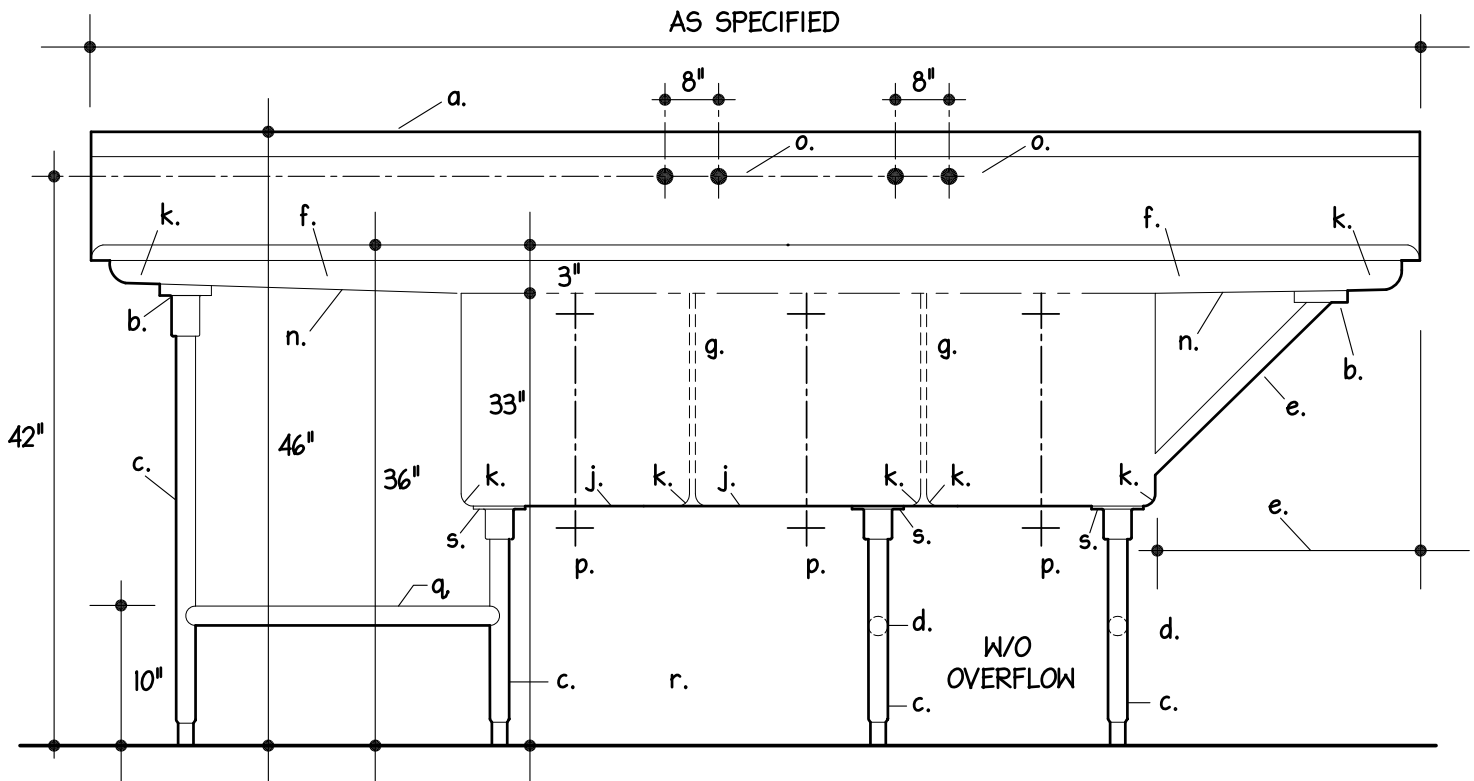
STD. - 1.07

CROSSBRACING

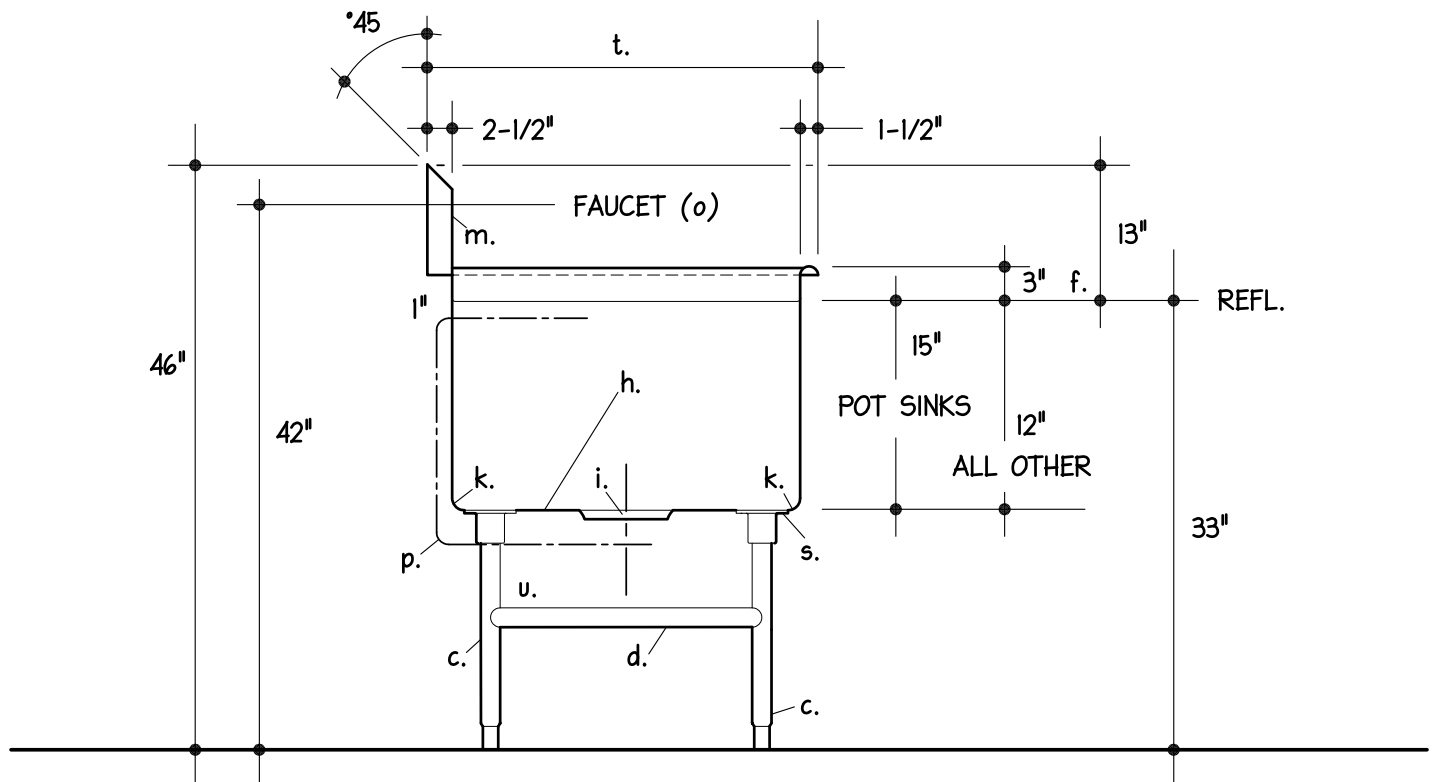
STD. - 1.10 WHEN
SPECIFIED.

UNDERSHELF

STD. - 1.11 WHEN
SPECIFIED.



ELEVATION



TYPICAL SECTION

a. MATERIAL - 14 GA. S/S.

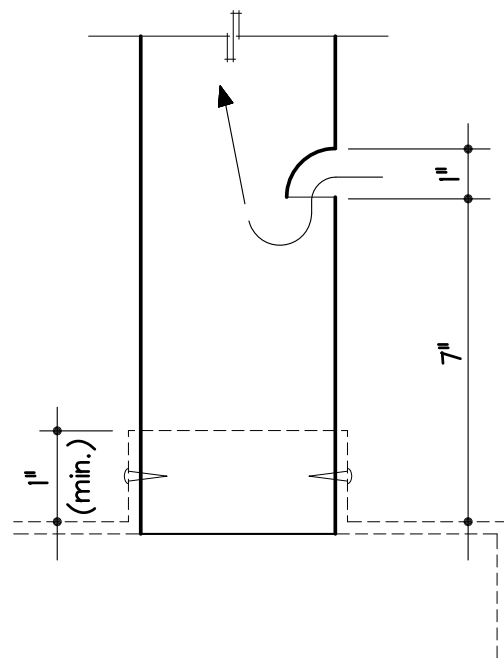
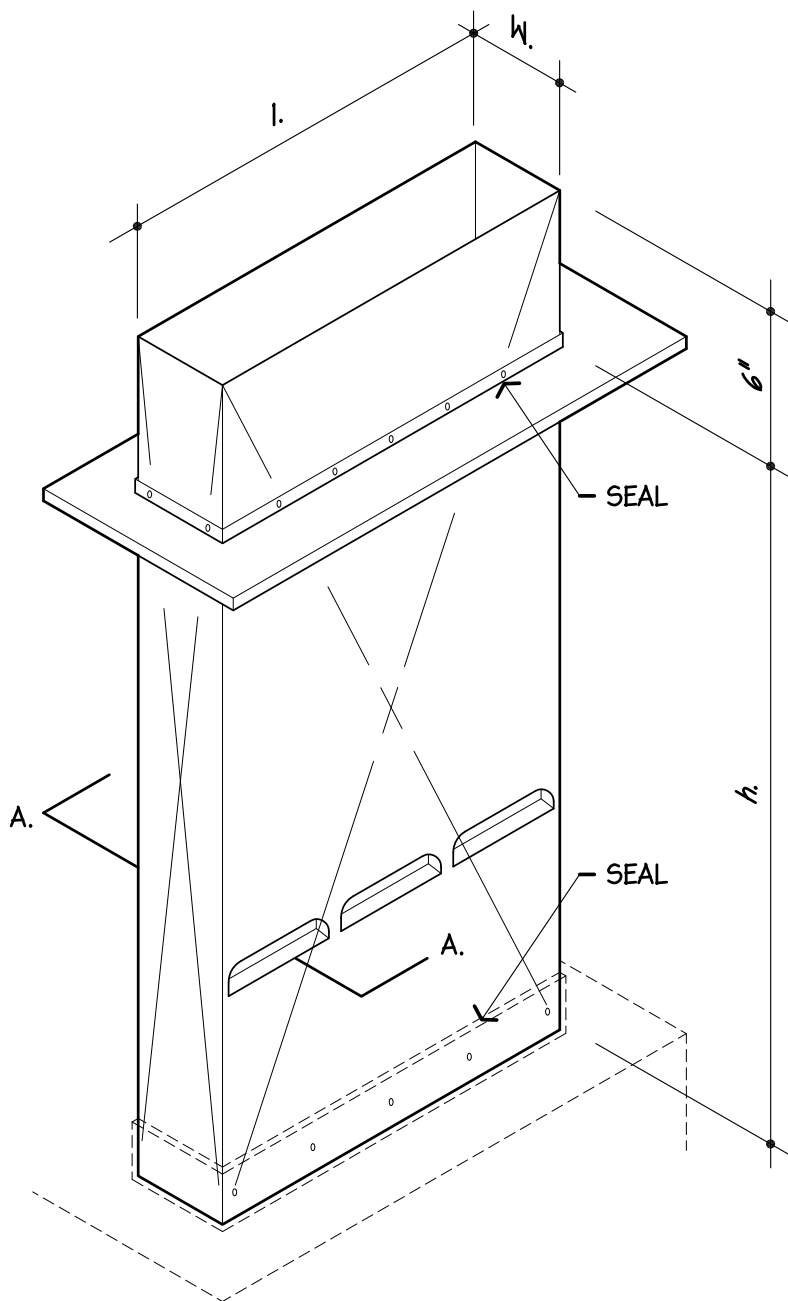
c. STD. - 1.07

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 5213 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Front projection screen assemblies.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Experienced in manufacturing products specified in this section.
- B. Installer Qualifications: Experienced in installation of the work of this section.

1.4 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. Store in a protected, clean, dry area with temperature maintained above 50 degrees F. Stack according to manufacturer's recommendations.

1.5 FIELD CONDITIONS

- A. Maintain interior of building between 60 degrees F and 75 degrees F during and after installation of projection screens.

1.6 WARRANTY

- A. Provide 5 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Da-Lite Screen Company: www.da-lite.com.
- B. Draper, Inc; : www.draperinc.com.

C. Stewart Filmscreen Corporation; : www.stewartfilmscreen.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ELECTRIC OPERATED PROJECTION SCREEN - STAGE

A. Manufacturers:

1. Da-Lite Screen Company, Model Large Advantage® Deluxe Electrol: www.da-lite.com.
2. Draper, Inc (Motorized); Premier Model #10179: www.draperinc.com.

B. Image Format: 16:10

C. Size: 105" x 168" Viewable, Diagonal 198"

D. Surface Material: Matte White XT1000V

E. Masking Borders: Black.

F. Drops: Black; 48 inches (top).

G. Exposed Screen Cases: Steel; integral roller brackets.

1. Finish: Baked enamel.
2. Color: White.
3. End Caps: Steel; finished to match case

H. Electrically-Operated Screens:

1. Roller: 5 3/4 inch aluminum, with locking device.
2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.
3. Mounting: Ceiling; Refer to details on drawings.

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.

C. Controls: 3 position control switch with plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that openings for recessed screens are correctly sized.

D. Verify type and location of electrical connections.

- E. 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 multiple screens in accordance with drawings and manufacturer's instructions. Verify that screens are aligned horizontally and vertically, and that spacing between screens is uniform and of minimum size.
- E. Install plumb and level.
- F. Install electrically operated screens ready for connection to power and control systems by others.
- G. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
- H. Test electrical screens for proper working condition. Adjust as needed.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11 6143 - STAGE CURTAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Stage curtain fabrics.
- B. Linings.
- C. Scrims and drops.
- D. Stage curtain track support systems.

1.2 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. FM (AG) - FM Approval Guide.
- D. ITS (DIR) - Directory of Listed Products.
- E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- F. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

- A. Product Data: Provide for each type of product as follows:
 - 1. Stage Curtains: Provide information on type of curtain, weight, location for use on project, and type of flame retardancy.
 - 2. Draw-Curtain and Fly-Curtain Operators: Provide rated capacities, and operating and electrical characteristics.
 - 3. Tracks: Provide capacity of each curtain track to support curtain weight and control curtain operation.
- B. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.
 - 1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
 - 2. Submit fabric assembly and support details.
 - 3. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
 - 4. Submit attachment locations for grand drape, backdrop curtain, and proscenium curtain, and corresponding loads imposed on structure.
 - 5. Submit locations of equipment components, switches, and controls; identify between manufacturer installed and field installed wiring.

- C. Selection Samples: Submit color chart for each type of stage curtain indicated that includes full range of colors, textures, and patterns available, along with 12 inch square fabric sample, in any color, of each fabric type and seam.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Delegated Design Data: Indicate stage curtain system structural attachments, including analysis data signed and sealed by qualified designer responsible for their preparation.
- F. Designer's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design of track support system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.5 FIELD CONDITIONS

- A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
 - 1. Wet work in adjacent areas is complete and surfaces are dry.
 - 2. Work at and above ceiling level has been completed.
 - 3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.
- B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.6 WARRANTY

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Stage Curtain Fabrics:
 - 1. Beck Studios Inc; ____: www.beckstudios.net/#sle.
 - 2. Fred Krieger & Company; ____: www.fredkriegerfabrics.com/#sle.
 - 3. LuXout Stage Curtains; ____: www.luxout.com/#sle.
- B. Stage Curtain Track Systems:
 - 1. Beck Studios Inc; ____: www.beckstudios.net/#sle.
 - 2. Fred Krieger & Company; ____: www.fredkriegerfabrics.com/#sle.
 - 3. LuXout Stage Curtains; ____: www.luxout.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

- A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.
- B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
 - 1. Design Loads: Weight of stage curtains and track system.
- C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.
 - 1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:
 - a. Inherently Flame Retardant (IFR), fibers/yarns that are non-combustible for life of fabric.
 - b. Durable Flame Retardant (DFR), fibers/yarns that are non-combustible for life of fabric.
 - c. Flame Retardant (FR), fabric has been topically treated in an immersion process with chemical fire retardant.
 - 1) Indicate retreatment requirements after cleaning or after designated period of time.
 - 2. Permanently attach swatch of matching fabric from same dye lot, at least 12 inch square, to backside of curtain assembly for use as fire-resistance test strip.

2.3 STAGE CURTAIN FABRICS

- A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.
- B. Polyester Velour: Weighing at least 25 ounces/linear yard, napped fabric of 100 percent polyester with minimum pile height of 75 mils, 0.075 inch and minimum width of 62 inch.
 - 1. Application: Draw curtains and Traveler curtains.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Texture: As selected by Architect from manufacturer's full range.
 - 4. Pattern: As selected by Architect from manufacturer's full range.

2.4 LININGS

- A. Polyester Lining: Weighing at least 12 ounces/linear yard, 100 percent polyester fabric and 60 inch minimum width.
 - 1. Color: Black.

2.5 CURTAIN TRACK

- A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.
 - 1. Thickness: As recommended by manufacturer for curtain loads and operation.
 - a. Heavy-Duty: 14 gage, 0.0747 inch minimum thickness.

- B. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.
- C. Curved-Suspended-Track Stiffener: Steel pipe, 1-1/2 inch nominal diameter, Grade A, Schedule 40 in accordance with ASTM A53/A53M; support both sections of curved suspended tracks, with curve to match track.
- D. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.
- E. Track-Lap Clamp: Clamp that matches track channel finish as necessary for attaching two tracks at center overlap.
- F. Folding Guide: Carriers, as indicated on drawings, with rear-fold or backpack guide and rubber spacers to fold curtain from offstage end of curtain; size for use with operating line as required.
- G. Operation:
 - 1. Manual Cord Operation: Curtain track with cord, pulleys, and floor pulley; must manually open and close the curtain.
 - a. Operating Line: 3/8 inch diameter, stretch-resistant operating cord with braided synthetic-fiber cover over solid, synthetic-fiber, linear filaments.
 - b. End Pulleys: One single dead-end and one double live-end pulley, with sheaves having shielded ball bearings housed in plated-steel covers that match track finish, and provide with bracket for securing off-stage end of curtain.
 - c. Floor Pulleys: Sheave, adjustable type with 3 inch (76 mm) diameter wheels, and having shielded ball bearings housed in plated-steel covers, painted black.
- H. Track System: Provide heavy-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.
 - 1. Carriers: Standard plated-steel carriers with a pair of nylon tired ball-bearing wheels riveted parallel to body, and equip carriers with rubber or neoprene bumpers to reduce noise and plated-steel swivel eye and trim chain for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.
 - a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier.
 - 2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with gas-filled-nylon-tired ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.6 FABRICATION - CURTAINS

- A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.
 - 1. Facing the full width of material at center meeting edges.
 - 2. Curtains that are tabled square, and hems that don't pucker.
 - 3. 1-1/2 inch clearance from floor at bottom of curtain.
 - 4. Curtains are 24 inch longer than clear height of valance opening.
 - 5. Curtains that overlap 36 inch at the center.
 - 6. Curtains that extend 24 inch on each side beyond full width of proscenium opening.
- B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:

1. Vertical Hems: Fabricate at least 2 inch wide, and at least 4 inch wide at borders, valances, teasers, and tormentors with at least 1 inch tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
 2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inch of face fabric, with at least 1 inch tuck, and vertically secured by sewing.
 3. Top Hems: Fabricate by double-stitching 3-1/2 inch wide, heavy jute or laminated synthetic webbing to top edge at back side of curtain with at least 2 inch of face fabric turned under.
- C. Fullness:
1. 50 Percent Fullness: Provide this fullness, exclusive of turnbacks and hems, and spaced at 12 inch on center along top hem reinforcement as follows:
 - a. Sewing additional material into 3 inch double-stitched, flat, box pleats.
- D. Grommets:
1. Black Colored Curtains: No. 3 brass, No. 4 brass, or aluminum grommets with black finish.
 2. Flat Curtains: No. 3 brass grommets at 12 inch on center and 1 inch from corner of curtain; for ties, snap hooks, or S-hooks.
 3. Pleated Curtains: Provide grommets centered on each box pleat and placed 1 inch from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:
1. For Curtains With Fullness:
 - a. Curtains That Don't Hang to Floor: Hems at least 3 inch deep, with weight tape, 3/4 inch, and open ends of hems sewn closed.
 2. Lining: Provide lining for curtain with matching fullness of face fabric and finished 2 inch shorter than face fabric, and sew or otherwise securely fasten lining to top hem of face fabric.

2.7 ACCESSORIES

- A. S-Hooks: Manufacturer's standard heavy-duty plated wire hooks, at least 2 inch long.
- B. Snap Hooks: Manufacturer's standard heavy-duty snap hooks, sewn into top edge of curtain.
- C. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, colored to best match curtain; at least 5/8 inch wide by 36 inch long and threaded through grommets.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.
- B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.3 INSTALLATION - CURTAIN

- A. Track Hung: Secure curtains to track carriers with S-hooks.
- B. Batten Hung: Secure curtains to pipe battens with S-hooks.

3.4 INSTALLATION - BATTENS

- A. Install battens by suspending at heights as indicated with trim and supports spaced as required to support loads; do not exceed 10 feet between supports.

3.5 INSTALLATION - TRACK

- A. Mounting of Track Assembly:
 - 1. Ceiling Mounted: Provide ceiling supports for mounting track direct to ceiling structure and within intervals indicated in manufacturer's written instructions for on center spacing.
 - 2. Beam Mounted: Install track by suspending from beam clamps securely mounted to structural I-beam and within intervals indicated in manufacturer's written instructions for on center spacing.
- B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
 - 1. Heavy-Duty Track: 6 feet, maximum.
- C. Install track for center-parting curtains with at least 24 inch overlap of track sections at center-line, and supported with track lap clamps.

3.6 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.
- B. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Location: At project site.

3.7 PROTECTION

- A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

END OF SECTION

SECTION 11 6623 - GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basketball backboards, goals, and support framing.
- B. Gymnasium exercise equipment.
- C. Floor sleeves for net and goal posts.
- D. Wall mounted protection pads.
- E. Gym divider curtains.
- F. Volleyball nets and posts.
- G. Climbing wall.

1.2 REFERENCE STANDARDS

- A. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 101 - Life Safety Code.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection locations.
 - 2. Structural steel welder certifications.
 - 3. Manufacturer's installation instructions.
- B. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
- C. Erection Drawings: Detailed dimensional requirements for proper location of equipment.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
 - 1. National Federation of State High School Associations (NFHS) sports rules.
- C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of contract documents.
- D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
- F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.2 DIVIDER CURTAINS

- A. Gymnasium Divider Curtains:
 - 1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester meeting NFPA 101.
 - a. Upper Section: 9 oz/sq yd vinyl mesh fabric.
 - b. Lower Section: 18 oz/sq yd solid vinyl coated polyester.
 - 2. Operation: Vertical lift roll-up, curtain coils on bottom rail .
 - 3. Controls: Wall switch.
 - 4. Size: 25'H x 50'W.
 - 5. Manufacturers:
 - a. Draper, Inc; Roll Up, Motorized: www.draperinc.com/#sle.
 - b. Performance Sports Systems; 4030 Roll-Up Curtain: www.perfsports.com.
 - c. Porter Athletic Equipment Company; 90675-000 Roll-Up Curtain: www.porterathletic.com

2.3 BASKETBALL

- A. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
 - 1. Framing: Center strut; forward folding framing.

2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 4. Height Control System: Electric hoist that adjusts backstop with 115 volt actuator, and integral limit switches that provide automatic shut-off in both positions.
 5. Framing Color: Manufacturer's standard.
 6. Manufacturers:
 - a. Draper, Inc; EZ Fold Ceiling Suspended Forward-Folding: www.draperinc.com/#sle.
 - b. Performance Sports Systems; 2607 Dual Post Front-Braced Front-Folding Ceiling Hung: www.perfsports.com.
 - c. Porter Athletic Equipment; 949 Series Ceiling Suspended Forward Fold, Front-Braced: www.porterathletic.com
- B. Backboards: Tempered glass, rectangular shaped.
1. Frame: Brushed aluminum edge, steel mounting.
 2. Markings: Painted.
 3. Color: Manufacturer's standard.
- C. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
1. Net Attachment Device: Tube-tie.
 2. Finish: Powder coat orange.

2.4 VOLLEYBALL EQUIPMENT

- A. Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
 2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
 3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
 4. Manufacturers:
 - a. Draper, Inc; Power Volleyball System (PVS): www.draperinc.com/#sle.
 - b. IPI by Bison, Inc; VB1000NS Centerline Aluminum: www.ipibybison.com/#sle.
 - c. Performance Sports Systems; 6005 Rallyline Volleyball System: www.perfsports.com.
- B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
1. Latch Cover: Brass, round; tamper resistant lock with key.
 2. Sleeve: Aluminum.
 3. Round Pole Diameter: 3 1/2 inches.
 4. Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.
 5. Manufacturers: Coordinate with post manufacturer.

2.5 EXERCISE EQUIPMENT

- A. Chinning Bar: Wall mounted steel bar, parallel to floor; adjustable for height.
1. Bar Diameter: 1 inch.
 2. Steel Bar Finish: Zinc-plated.
 3. Steel Frame Finish: Powder coating, manufacturer's standard color.
 4. Manufacturers:

- a. Draper, Inc; 502015 Deluxe Adjustable Wall Chinning Bar: www.draperinc.com.
 - b. Performance Sports Systems; 109 Adjustable Chin Up Bar: www.perfsports.com.
 - c. Porter Athletic Equipment; G-197-1 Adjustable Chinning Bar: www.porterathletic.com.
- B. Transverse Climbing Wall: Modular climbing wall assembly with mat-locking system.
1. Assembly Size: 8 feet (high) x 40 feet (long).
 2. Panels: Glass Fiber Reinforced Polymer (GFRP).
 - a. Size: Manufacturer standard to achieve overall assembly size.
 - b. Finish: Architect to select from Manufacturer's full standard and custom range.
 - c. Contours/Texture: Manufacturer's standard molded to simulate rock.
 3. Handholds: Manufacturer's standard molded polyurethane.
 - a. Total Quantity: 200
 - 1) Unduplicated Quantity: 120
 - b. Fasteners: T-nuts, sized per Manufacturer recommendation.
 4. Mat-Locking System: Vinyl-coated polyurethane foam.
 - a. Size: 6 feet (high) x 40 feet (long).
 - b. Thickness: 2" standard.
 - c. Covering: 18-oz polyester-reinforced vinyl.
 - d. Hardware: Manufacturer's locking-system
 - e. Provide "NO CLIMBING" decal on underside of mat to show that wall is closed when mats are raised and locked.
 - f. Manufacturers:
 - 1) Everlast Climbing, A Playcore Company; Standard Climbing Wall: www.everlastclimbing.com
 - 2) Spectrum Sports, Intl; Modular Climbing Panels: www.spectrumssports.com
 - 3) Eldorado Climbing Walls; SOLIDRock: www.eldowalls.com

2.6 WALL PADDING

- A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
1. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
 - a. Color: As selected from manufacturer's standard range.
 - b. Texture: Embossed leather-look.
 - c. Fabric Weight: 14 oz/sq yd.
 2. Foam: Urethane, soft, 3.5 pcf nominal density.
 3. Foam: Open cell polychloroprene (Neoprene) 5.5 pcf nominal density.
 4. Foam Thickness: 1-1/2 inches.
 5. Backing Board: Plywood.
 6. Mounting: Permanent; using screws.
 7. Manufacturers:
 - a. Draper, Inc; EcoVision Wall Pad: www.draperinc.com/#sle.
 - b. Performance Sports Systems; 4130 Standard Foam Wall Pad: www.perfsports.com.
 - c. Porter Athletic Equipment; 560 - DuraSafe Wall Pad: www.porterathletic.com.
- B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
1. Wall corners.
 2. Door and wall openings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.

3.2 INSTALLATION

- A. Install in accordance with contract documents and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.
- F. Separate dissimilar metals to prevent electrolytic corrosion.

3.3 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

3.4 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.5 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 9500 - SPECIALTY EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Ceramic Kilns.

1.2 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide Manufacturer cut information including accessories included..

1.4 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3 year manufacturer warranty for Ceramic Kilns.

PART 2 PRODUCTS

2.1 12-SIDED CERAMIC KILN

- A. Basis of Design Manufacturer: Skutt Ceramic Products, 6441 S.E. Johnson Creek Blvd., Portland, Oregon 97206, Model KM 1027 or approved equal.
- B. Description:
 - 1. Size: 7 Cubic Feet
 - 2. Minimum Space Requirements: 58" wide x 58" deep
- C. Operation:
 - 1. Controls: Dyna Trol Multi-Program Zone Control
 - 2. Six User-Defined Programs
 - a. Delay Time
 - b. Preheat
 - c. Hold
 - d. Offsets
- D. Features:
 - 1. Loading: Lid position, when open, rests at an angle away from the kiln without lid supports so that loading is easy.
 - 2. Hinge: Spring loaded for easy opening while still allowing lid to be supported without supports that get in the way of loading.
 - 3. Stand: Heavy-duty 14 gauge full solid stand with multiple bends for strength. Bolt on legs. Feet protectors included. Coordinate with kiln vent system.
 - 4. Assembly: Two or three 9" high sections stack on top of each other. Easy to assemble. Bottom is reversible.
 - 5. Accessories: Furniture Kit (internal shelving).

6. Construction: Stainless steel wrapped around brick with 3 clamps on each section. All stainless screws.
7. Insulation: 3" K23 firebrick.
8. Brick Coating: Reflective coating protects brick and reduces dusting
9. Element Holders: Hard ceramic element holders protect brick.
10. Elements: Heavy-duty. 2 elements per 9" high section.
11. Element Connections: Proprietary all-ceramic element connection block makes changing elements easy.
12. Control Panel: All controls and components are mounted in a separate control panel that is piggy-backed to the element connection box. A layer of insulation and this separation helps keep the controls cool. The control panel and element box are hinged for easy access and maintenance. Control box can be easily removed for servicing. On/off switch and control fuse are included.
13. Zone Control: Two or three zones with separate thermocouples.
14. Peephole Plugs: Non-fragile solid ceramic with heat-locked head. 1" diameter full-view non-tapered. One per section.
15. Thermocouples: Type K 8 gauge with ceramic protection tubes.
16. Relays: Mercury free relays.
17. Power Cord/Plug: 50 Amp NEMA 6-50 six foot cord included for one phase, 50 Amp NEMA 15-50 six foot cord included for three phase. Instructions: Complete visual instructions with control reference, process information, assembly, troubleshooting, and parts list. In addition a web videos
18. Warranty: Limited 3 year warranty.
19. UL Listing: c-MET-us listed to UL499 standards.

E. Vent System:

1. Manufacturer: Skutt Ceramic Products
2. Model Number: Envirovent 2
3. Power: Includes wall mount blower with 120 volt cord and cord mounted on/off switch, 90 elbow for mounting to the duct that sticks out of the wall, 15 feet of aluminum flexible duct, the bypass collection box that mounts to the bottom of one of the stands.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that the proper space, clearances, ventilation and electrical requirements are provided..

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.3 SYSTEM STARTUP

- A. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

3.4 COMMISSIONING

- A. Test electrical grounding for compliance with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 12 2400 - WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Window shades and accessories.

1.2 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
- C. WCMA A100.1 - Safety of Window Covering Products.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details.
- C. Selection Samples: Include fabric samples in full range of available colors and patterns.
- D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience.

1.6 MOCK-UP

- A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
 - 1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
 - 2. Full-sized mock-up may become part of the final installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

- B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 WARRANTY

- A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.
 - 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manually Operated Roller Shades:
 - 1. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
 - 2. Levolor; _____: www.levolor.com/commercial/#sle.
 - 3. Mecho Shade Systems: www.mechoshade.com.

2.2 WINDOW SHADE APPLICATIONS

- A. Roller Shades: _____.
 - 1. Type: Roll down, closed position is at window sill.
 - 2. Fabric Performance Requirements:
 - a. Openness Factor: 3%.
 - 3. Color: As selected by Architect from manufacturer's full range of colors.
 - 4. Mounting: As indicated on drawings..
 - 5. Operation: Manual.

2.3 ROLLER SHADES

- A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
 - 1. Drop: Regular roll.
 - 2. Size: As indicated on drawings.
- B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Sheer Shades: Reduce glare yet still reveal considerable details to the outside; no privacy; Openness Factor greater than 1 percent.
 - 2. Flammability: Pass NFPA 701 large and small tests.
- C. Roller Tubes: As required for type of operation.
 - 1. Material: Extruded aluminum or galvanized steel; as required for shade location.
 - 2. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
 - 3. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 - 4. Finish: Baked enamel; color from manufacturer's standards.
- D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
 - 1. Style: Half wrap fabric covered bottom bar, flat profile with closed ends.

2. Finish: Painted.
3. Color: As selected from manufacturer's standard colors.

E. Manual Operation for Interior Shades: Clutch operated continuous loop; beaded ball chain.

2.4 ACCESSORIES

- A. Fascias: Size as required to conceal shade mounting.
 1. Style: As selected by Architect from shade manufacturer's full selection.
 2. Material and Color: To match shade.
- B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.
- C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.5 FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Fabricate shades to fit openings within specified tolerances.
 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
 2. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Installation Tolerances:
 1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
 2. Maximum Offset From Level: 1/16 inch.

- C. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.6 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3200 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured Standard casework, with cabinet hardware.
- B. Special purpose units.
- C. Mobile cabinets.

1.2 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware.
- C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- D. NEMA LD 3 - High-Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- C. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
- D. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- E. Finish touch-up kit for each type and color of materials provided.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.6 MOCK-UP

- A. Provide full size base cabinet complete with drawers, door, adjustable shelf and countertop.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 1. Ruptured, cracked, or stained finish coating.
 2. Discoloration or lack of finish integrity.
 3. Cracking or peeling of finish.
 4. Failure of hardware.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Plastic Laminate Casework:
 1. Case Systems; ____: www.casesystems.com/#sle.
 2. Institutional Casework, Inc.: www.iciscientific.com.
 3. Stevens Industries: www.stevensadvantage.com
- B. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.2 CASEWORK, GENERAL

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom Grade.

2.3 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Structural Performance: Safely support the following minimum loads:
 1. Base Units: 500 pounds per linear foot across the cabinet ends.
 2. Suspended Units: 300 pounds static load.

3. Drawers: 125 pounds, minimum.
 4. Hanging Wall Cases: 300 pounds.
 5. Shelves: 100 pounds, minimum.
- D. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
 - E. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.
 - F. Removable back panels on all base cabinets. Provide partial height back panels at sink cabinets.
 - G. Fixed panels at backs of open spaces between base cabinets.
 1. Provide cutouts for power receptacles where indicated on drawings.
 - H. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
 - I. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
 - J. Mobile Cabinets: Same construction as fixed base cabinets, with modifications.
 1. Toe kick space eliminated.
 2. Cabinet underside reinforced as is standard with the manufacturer to provide caster mounting points.
 3. Four casters, each with a load rating of 165 pounds.
 4. For cabinets with drawers, include a counterweight to prevent the cabinet from tipping when one drawer is opened.
 - a. Rate drawers at 50 pounds maximum.
 - K. Apron Frames: Construction similar to other cabinets, with modifications.
 - L. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

2.4 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings.
 3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As selected by Architect from manufacturer's full line.
 - c. Exposed Interior Surfaces: Thermally fused laminate.
 - 1) Color: Match exposed surfaces.
 - d. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.5 COUNTERTOPS

- A. Countertops: As specified in Section 12 3600.

2.6 SPECIAL PURPOSE UNITS

- A. Musical Instrument Storage Special Units.
 - 1. Basis of Design Manufacturer: Wenger.
 - 2. Style: Flush Inset, Type A. Ease doors and drawer fronts slightly at edges.
 - 3. Primary Construction: Plastic-laminate clad units.
 - a. Design: Modular units with through-bolted fastening for reconfigurable assembly.
 - b. Cabinet Hardware: Manufacturer's standard, types as required for drawers, doors, shelves, levelers and similar items.
 - c. Finish, Surface Color and Pattern: As selected by Architect from manufacturer's standard line.
 - 4. Large and Small Instrument Storage Units: Manufacturer's standard; sizes and configurations indicated on drawings.

2.7 CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes.
- B. Conform to BHMA A156.9 requirements.
- C. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 6 keys per lock.
 - 1. Hinged Doors: Cam type lock, satin chromium plated over nickel on base material.
 - 2. Tall Hinged Doors: Three-point latching system.
 - 3. Keying: Key locks alike within a space; key each room separately.
 - 4. Master Key System: All locks operable by master key.
- D. Swinging Doors: Hinges, pulls, and catches.
 - 1. Hinges: Visible, number as required by referenced standards for width, height, and weight of door.
 - a. Concealed Hinges: Installed in cabinet edge, and on door back, satin chromium plated over nickel on base material.
 - 1) European-Style Hinges for Overlay Doors: 110 degree opening angle.
 - 2. Pulls: Chrome wire pulls, 4 inches wide.
 - 3. Catches: Magnetic.
- E. Drawers: Pulls and slides.
 - 1. Pulls: Chrome wire pulls, 4 inches wide.
 - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.8 MATERIALS

- A. Wood-Based Materials:
 - 1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
- B. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.

- C. Semi-Exposed Solid Wood: Dry, sound, plain sawn, no appearance defects, any species similar in color and grain to exposed portions.
- D. Hardwood Plywood: Veneer core; HPVA HP-1 Grade as indicated; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.
- E. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.

2.9 ACCESSORIES

- A. Grommets: Standard plastic grommets for cut-outs, in color as selected by Architect from manufacturer's standard range..
- B. Sealant for Use in Casework Installation:
 - 1. Manufacturer's recommended type.

PART 3 EXECUTION

3.1 PREPARATION

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.2 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
 - 1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
 - 2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- D. Verify adequacy of support framing and anchors.
- E. Verify that service connections are correctly located and of proper characteristics.

3.3 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.
- G. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- H. Install hardware uniformly and precisely.
- I. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- J. Replace units that are damaged, including those that have damaged finishes.

3.4 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.5 CLEANING

- A. Clean casework and other installed surfaces thoroughly.

3.6 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.
- C. Window sills.
- D. Wall-hung counters and vanity tops.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. AWI (QCP) - Quality Certification Program.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- E. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.
- F. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII.
- G. NEMA LD 3 - High-Pressure Decorative Laminates.
- H. PS 1 - Structural Plywood.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Installation Instructions: Manufacturer's installation instructions and recommendations.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS AND WINDOW SILLS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 - a. Manufacturers:
 - 1) Formica Corporation; _____: www.formica.com/#sle.
 - 2) Panolam Industries International, Inc. Nevamar; _____: www.nevamar.com.
 - 3) Panolam Industries International, Inc. Pionite; _____: www.pionitelaminates.com.
 - 4) Wilsonart; _____: www.wilsonart.com/#sle.
 - 5) Substitutions: See Section 01 6000 - Product Requirements.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - d. Finish: Matte or suede, gloss rating of 5 to 20.
 - e. Surface Color and Pattern: As indicated on drawings.
 - 2. Back and End Splashes: Same material, same construction.
 - 3. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.

- C. Solid Surfacing Window Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont; _____: www.corian.com/#sle.
 - 2) Formica Corporation; _____: www.formica.com/#sle.
 - 3) Wilsonart; _____: www.wilsonart.com/#sle.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As indicated on drawings.
 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. Fabricate in accordance with manufacturer's standard requirements.
- D. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
1. Circulation Desk (Media Center 001) and Reception Desk (Admin Reception 101): Base Bid
 2. All other countertops: Add Alternate No. 5.
 3. Flat Sheet Thickness: 1-1/4 inch, minimum.
 4. 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) Seieffe Corporation; OKITE®: www.okite.us/#sle.
 - 2) Terrazzo & Marble Supply Companies; DIFINITI Quartz: www.tmsupply.com/#sle.
 - 3) Wilsonart; _____: www.wilsonart.com/#sle.
 - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
 - c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - d. Finish on Exposed Surfaces: Polished.
 - e. Color and Pattern: As selected by Architect from manufacturer's full line.
 5. Other Components Thickness: 3/4 inch, minimum.
 6. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 7. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.2 MATERIALS

- A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.
- 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. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. Joint Sealant: Mildew-resistant silicone sealant, white.

2.3 ACCESSORIES

- A. Grommets: Standard plastic grommets for cut-outs, in color as selected by Architect from manufacturer's standard range.
 - 1. Location: As indicated on drawings.

2.4 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and window sills up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
- D. Wall-Mounted Counters: Provide 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 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 4813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Extruded aluminum entrance floor grilles.
- B. Recessed mat frames.

1.2 SUBMITTALS

- A. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.
- B. Shop Drawings: Indicate dimensions and details for recessed frame.
- C. Samples: Submit two samples, ___ by ___ inch in size illustrating pattern, color, finish, and edging.
- D. Maintenance Data: Include cleaning instructions, ____, and stain removal procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Entrance Floor Grilles and Gratings:
 - 1. Babcock-Davis; ____: www.babcockdavis.com/#sle.
 - 2. Nystrom, Inc; envIRONtread II Rigid Grille: www.nystrom.com/#sle.
 - 3. Pawling Corporation; ____: www.pawling.com/#sle.

2.2 ENTRANCE FLOOR GRILLES AND GRATINGS

- A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 11/16 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
 - 1. Recess Depth: 15/32 inches.
 - 2. Tread Surfaces: Buffed nylon-reinforced truck and airplane tire strips.
 - a. Minimum 59% post-consumer and 29% pre-consumer recycled content.
 - 3. Colors: To be selected by Architect from manufacturer's full selection.
 - 4. Dimensions: As indicated on drawings.
 - 5. Frame: Anodized aluminum for embedding in concrete; minimal exposed trim; stud or hook concrete anchors.
- B. Mounting: Top of non-resilient members level with adjacent floor.
- C. Structural Capacity: Capable of supporting a rolling load of 1500 pounds without permanent deformation or noticeable deflection.
- D. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.3 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
- B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 PREPARATION

- A. Mats: Verify size of floor recess before fabricating mats.
- B. Vacuum clean floor recess.

3.3 INSTALLATION

- A. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

- A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 12 5000 - CLASSROOM AND OFFICE FURNITURE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Classroom and office furniture including the following:
 - 1. STEM Lab Tables.
 - 2. STEM Lab Stools.

1.2 REFERENCES

- A. GREENGUARD Environmental Institute (GEI):
 - 1. GREENGUARD certified low emitting products.
- B. US Green Building Council (USGBC):
 - 1. Leadership in Energy and Environmental Design (LEED) Green Building Rating System.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Verification Samples: For each finish product specified, two samples, representing actual product and finish.
- C. LEED Submittals:
 - 1. Credit EQ 4.4: Manufacturer's certificate indicating that composite wood products and adhesives used in casework with no urea formaldehyde added.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years of experience in manufacture of similar products in use in similar environments.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle casework in accordance with manufacturer's recommendations. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept casework and recommended temperature and humidity levels will be maintained during the remainder of construction.

1.6 WARRANTY

- A. Warranty: Manufacturer's written warranty indicating manufacturer's intent to repair or replace components of music education storage casework that fail in materials or workmanship within 10 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:
 - 1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.
 - 2. Delamination or other failures of glue bond of components.

3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.

PART 2 PRODUCTS

2.1 STEM LAB TABLE

A. MANUFACTURERS

1. MityBilt Products, Inc.: www.mitybilt.com
2. Fleetwood Design Studio: www.fleetwoodfurniture.com
3. Alumni Classroom Furniture, Inc.: www.alumnicf.com

B. MATERIALS

1. Frame
 - a. 16 gauge steel frame.
 - b. Adjustable height 30"-42"
 - c. 2" diameter legs
 - d. Non-removable full-swivel locking castors
 - e. Finish: Powder coat
 - f. Color: Architect to select from Manufacturer's full range.
2. Top
 - a. 1 3/4"TH Maple "butcher block" top
 - 1) Nominal 4/4 rails
 - 2) Face-glued
 - b. Dimensions: 36"W x 60"L
 - c. Edge Profile: 1/8" radius
 - d. Finish: Clear catalyzed lacquer

2.2 STEM LAB STOOL

A. MANUFACTURERS

1. MityBilt Products, Inc.: www.mitybilt.com
2. Fleetwood Design Studio: www.fleetwoodfurniture.com
3. Alumni Classroom Furniture, Inc.: www.alumnicf.com

B. MATERIALS

1. Adjustable height 20"-30"
 - a. Pneumatic/Gas-lift.
2. One-piece molded plastic seat
 - a. Concealed seat attachments
3. 360 degree swivel with adjustable foot ring
4. 5-star base with glides

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction. Test for proper operation and adjust until satisfactory results are obtained.

3.4 CLEANING AND PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Clean surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

END OF SECTION

SECTION 12 5600 - SPECIALIZED STORAGE SYSTEMS

PART 1 GENERAL

1.1 SCOPE

- A. It is the purpose of this specification to establish requirements for mobile storage systems and to provide the owner with a durable and functional product. The construction methods of joinery, material and material thickness shall be in accordance with the standards set forth herein.
- B. Equipment installation shall include coordination, delivery, receiving, set up "complete" and final cleaning. Immediately notify manufacturer's agent in the event of any damaged product, take photographs and document specific details such as type of product, specific location and shipping information. Remove from inventory if damage creates safety concerns of the end user.
- C. Take necessary precautions to protect finish of other product and repair or make arrangements for the repair or replacement of all installation damage as required to a like new condition.
- D. If applicable, check and verify all conditions and dimensions at project location prior to installation and notify owner of any irregularities prior of installation.
- E. In the event of supplied materials to Furniture, Cabinetry or Millwork subcontractor, it shall be the subcontractor's responsibility to coordinate the exact installation requirements at the time of shop drawings. Additionally, subcontractor shall provide a mockup of finished product to insure guide rails and trays operate successfully.
- F. It shall be the intent of these specifications to provide a single source "system" of components that permits the end users to simply and effectively manage the smallest of components to the largest storage needs. The "system", as indicated below, is comprised of tote trays, lids and inserts as well as carts of various sizes and capacities to a series of wall storage units that can be seen as a repository of all educational resources. This "system" has been fully designed with the intent that all components can be integrated in endless configurations for unlimited tasks and needs.

1.2 RELATED WORK

- A. Furniture, cabinetry and or Millwork subcontractor shall coordinate guide rail and tray installation if necessary.

1.3 SUBMITTALS

- A. Shop drawings, if required, shall be submitted in accordance with applicable requirements of section 01 3300 within 30 days execution of Owner-Contractor agreement. Drawings shall consist of specific product details including but not limited to all dimensions, thickness and tolerances required for the exact coordination into existing cabinetry.
- B. Templates shall be provided only upon request of subcontractor.
- C. Provide physical product samples for each type only if necessary for coordination into subcontractor's work.

1.4 PRODUCT HANDLING

- A. Protect all equipment during transit, delivery, storage and handling to prevent damage and soiling. Manufacture shall provide all protective wrappings.
- B. If required, store products at project site in pre-installation storage areas with similar ambient conditions as final installation or in off-site solutions as required by manufacturer.

1.5 WARRANTY

- A. Manufacturer shall warranty ALL products manufactured by it to be free of defects and material workmanship when properly installed under normal use for a period of three (3) years from the date of substantial completion.
- B. Manufacture shall additionally provide a limited-lifetime warranty for all components constructed from HIPS, High Impact Polystyrene. Warranty shall specifically detail shatterproof characteristics resulting from BS: 5873 (1998) Part 4 for an impact drop test or approved equal. Components constructed from ABS, Acrylonitrile Butadiene Styrene shall additionally be provided with a limited lifetime warranty.

PRODUCTS

2.1 MANUFACTURERS

- A. Specifications are based on the StorSystem™ line of products as manufactured by Certwood, Limited, Luton, England. Products and catalog number contained within this guide specification are used as a basis of identification, configuration, size and quality.
- B. Products shall be supplied to the North American markets from a warehouse facility in Wintersville, Ohio.
- C. Comparable units, modified if so required, to be in compliance with these specifications by meeting or exceeding these specifications, by MityBilt Products Inc, Stonewall, Manitoba, Canada will be considered equal if deemed acceptable upon review of the substitution review process.

2.2 DESIGN

- A. Provide a system of integrated, modular storage components that can be simply and easily combined to create a 3-tiered holistic approach to storage that is mobile as well as customizable and reduces the footprint over traditional storage solutions.

2.3 MATERIAL AND CONSTRUCTION

- A. Hips, High Impact Polystyrene.
 - 1. Shatterproof solid color Tote Trays, and Inserts shall be constructed from HIPS, High Impact Polystyrene passing the standards of BS: 5873 (1998) PART 4 for an impact drop test. More specifically products must be able to withstand a bull nosed steel weight equaling 1.25kg (2.75lbs) dropped from a height of 1.5 meters (5 ft.), remaining intact and unbroken after ten consecutive drop tests.
 - a. Primary Solid "standard" color options shall be Primary Red, Primary Yellow, Primary Blue, Primary Green and Light Gray.

- b. Pastel solid “special” color options shall be Pastel Orange, Pastel Blue, Pastel Green, and Pastel Lilac.
 - c. Bold solid “special” colors shall be Burgundy Red, Dark Blue, Dark Grey, and Jade Green.
 - d. “Special” colors are defined as colors that need to be requested by the manufacture for pricing and delivery structures.
 - 2. Products manufactured from Talc Filled Polypropylene will not be deemed acceptable unless bearing test results from standard BS: 5873 (1998) part 4 for an impact drop test.
- B. Super Tuff ABS, Acrylonitrile Butadiene Styrene
 - 1. “Shatterproof” Crystal Line Tote Trays, lids and Rails shall be constructed from Super Tuff ABS, Acrylonitrile Butadiene Styrene.
 - a. Crystal line “standard” color options shall be Crystal Clear, Tinted Blue, Tinted Purple, Neon Orange and Neon Green.
 - 2. Translucent products manufactured from Talc Filled Polypropylene will not be deemed acceptable.
- C. Tote Trays:
 - 1. Slim Line” Standard Width (SW) 12” by 16 ¾” deep wide tote trays shall be available in depths of 3” (single-depth), 6” (double-depth), 9” (triple-depth) and 12” (quad-depth) specifically designed to be used in conjunction with the Glide & Tilt® Tote Tray Runner System, tote tray inserts and are available with optional crystal clear, see through lids.
 - 2. “Wide Line” Extra Wide (EW) 18 ½” wide by 16 ¾” deep tote trays shall be available in depths of 3” and 6” specifically designed to be used in conjunction with the Glide & Tilt® Tote Tray Runner System and are available with optional crystal clear, see through lids.
 - 3. Internal, rectangular area of trays shall be free of obstructions to maximize storage area and shall permit the nesting of optional tote tray inserts with or without the optional lids.
 - 4. Tote trays shall be completely manufactured with internal radius corners, no less than a radius of 3/16” or 5.5 mm for “ease of cleaning” in the most stringent sanitary environments. Products manufactured with corners less than a radius of 3/16” or 5.5 mm will not be deemed acceptable.
 - 5. Tote trays shall be reversible within the Glide & Tilt® Tote Tray Runner System permitting the tray to be inserted in any direction.
 - 6. Tote trays shall be stackable with the use of optional lids. Bottom of tote tray shall nest securely within the lid of the lower tote tray, prohibiting the tote trays to slide when transporting in a stacked configuration.
 - 7. Tote trays shall be designed with a dual labeling system, one on each end. “Front” system shall be provided with a removable translucent ticket window providing the option to utilize an internal label or external writable surface. “Rear” labeling system or “E-Z Peel” area shall be designed and manufactured no less than 2” high x 8 ¼” wide with stipples no less than .004” above the face of the tote tray providing a surface to easily apply and remove larger sticky labels.
- D. Runners:
 - 1. Tote tray runners shall be utilized for all mobile and fixed storage solutions and shall be the patented Glide & Tilt® Tray Runner System with integrated “Arrestor & Tilt” feature. Arrestor and Tilt holds the tray in an angled open position making easy access and clear display of the tray contents. Systems that do not permit full access to tray contents while within the storage component will not be deemed acceptable.
 - 2. The “Shatterproof” tote tray structural runners shall be molded from Acrylonitrile Butadiene Styrene (ABS) Plastic and be provided in single and triple module options.
 - 3. Runners shall be available for either metal or wood construction.
 - a. Structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to

- the steel frames with 1/4" tap screws. Color shall be Light Gray, Dark Gray or Crystal clear
- b. Runners specifically designed for wood construction shall be manufactured with tab inserts to inset into predrilled vertical cabinet faces. Runners shall be secured to the wood frames with 1/4" wood screws. Color shall be Beige or Crystal Clear.
- 4. Runner system shall be designed to permit any combination of tote tray depths for a specific width. Runners with protruding catch mechanisms that prohibit use of a variety of tote tray heights will be deemed unacceptable.
- 5. The Glide & Tilt® Structural Runner, available as a Triple or Single module, shall be designed as a structural element for use with metal frames.

E. Carts:

1. Mobile Series

- a. Mobile series fully welded metal cart frames shall be constructed from 16 ga. baked-on epoxy powder coated; 1" square steel tubing. Structural tote tray runners are securely anchored to the steel frames with 1/4" tap screws.
- b. Top panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
- c. "Optional" side and rear panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
- d. Product coatings are specifically designed to resist wear, abrasion, corrosion and chemicals and offer the ability of the panels to be utilized as a dry erase surface.
- e. Glide & Tilt® structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to the steel frames with 1/4" tap screws.
- f. Mobile series metal cart frames shall be provided with (4) 3-inch heavy-duty swivel casters with, stainless steel bumper and sealed internal ball bearings to provide ease of movement. Casters shall be provided with friction fitted coated steel frame inserts.
- g. Depths of all units shall be 18" "out to out." This dimension incorporates an additional 1/2" projection for widest projection of the caster bumper for design purposes. The actual physical dimension of the upper frame assembly is 17".
- h. Mobile series carts shall be offered with six (6) "Slim line" size options in two heights: 29 1/4" high units shall be provided in 6, 12 and 18 modules for the various tote tray combinations, 40 3/4" high units shall be provided in 9, 18 and 27 modules for the various tote tray combinations.
- i. Frame and panel colors shall be White, Dark Gray (Charcoal) or Light Gray. Custom colors are available.
- j. Cart Schedule:
 - 1) Double Column Mobile Cart (Keynote 125600-D)
 - (a) 29 1/2"W x 29 1/4"H x 18"D
 - (b) 12 slim line tray module spaces
 - (c) 4 single-depth slim line trays
 - (d) 4 double-depth slim line trays
 - (e) Basis-of-Design: StorSystem CE2101 - Swift Cart
 - 2) STEM Lab/Makerspace Mobile Cart (Keynote 125600-E)
 - (a) 42 1/2"W x 38 3/8"H x 25"D
 - (b) Adjustable open shelving
 - (c) Magnetic peg-board back/sides
 - (d) 18 slim line tray module spaces
 - (e) 6 single-depth slim line trays
 - (f) 6 double-depth slim line trays
 - (g) Basis-of-Design: StorSystem CE2500 Innov-8

2. Traditional Series

- a. Cabinet construction shall be a nominal $\frac{3}{4}$ " high performance melamine faced chipboard "MCF." All units shall be constructed from one-piece panels.
- b. All panels shall be edge banded with high performance high impact resistance PVC edging.
- c. Panels shall be joined with a fluted dowel pin construction. Panels shall be assembled under controlled case clamp conditions assuring final cabinet squareness and proper joint compression.
- d. Glide & Tilt® Tote runners specifically designed for wood construction shall be manufactured with fluted tab inserts to inset into predrilled vertical cabinet faces. Side panels shall be precision bored to receive fluted runner tabs. Runners shall be secured to the wood frames with $\frac{1}{4}$ " wood screws.
- e. Cabinet boxes are available in pearwood finish. See specific component specification for color options.

F. Wall Units:

1. Fully welded, metal wall unit frames shall be constructed from 16ga. baked-on epoxy powder coated; 1" square welded steel tubing. Structural tote tray runners are securely anchored to the steel frames with $\frac{1}{4}$ " tap screws.
2. Top panels shall be constructed from 18 ga. formed steel, baked-on epoxy coated sheets securely fastened to the steel frames with hex head machine screw fasteners.
3. Glide & Tilt® Tote structural runners specifically designed for steel construction shall be manufactured with a vertical alignment rail to the inside of the runner. Runners shall be secured to the steel frames with $\frac{1}{4}$ " tap screws.
4. Wall units shall be offered with six (2) "Slim line" size options in two heights: 75 $\frac{1}{4}$ " high units shall be provided in 36 and 54 modules for the various tote tray combinations.
5. All wall units are provided with four (4) coated steel metal frame connectors, 4 frame caps and 4 adjustable feet.
6. Wall units shall be anchored to an adjacent wall surface utilizing manufacturer's standard steel angle clips for additional support.
 - a. When attached to gypsum board and stud wall assembly, wood blocking shall be provided in the wall for attachment of clips.
7. Wall Unit Schedule:
 - a. Double Column Wall Unit (Keynote 125600-A)
 - 1) 28 $\frac{3}{4}$ "W x 75 $\frac{1}{4}$ "H x 18"D
 - 2) 36 tray module spaces
 - 3) 20 single-depth slim line trays
 - 4) 8 double-depth slim line trays
 - 5) Basis-of-Design: StorSystem CE2090
 - b. Triple Column Wall Unit (Keynote 125600-B)
 - 1) 42 $\frac{1}{2}$ "W x 75 $\frac{1}{4}$ "H x 18"D
 - 2) 54 tray module spaces
 - 3) 54 single-depth slim line trays
 - 4) Basis-of-Design: StorSystem CE2091
 - c. Triple Column Wall Unit (Keynote 125600-C)
 - 1) 42 $\frac{1}{2}$ "W x 75 $\frac{1}{4}$ "H x 18"D
 - 2) 54 tray module spaces
 - 3) 30 single-depth slim line trays
 - 4) 12 double-depth slim line trays
 - 5) Basis-of-Design StorSystem CE2091

G. Accessories:

1. Lids:
 - a. Optional "shatterproof" lids shall be manufactured from Super Tuff ABS, Acrylonitrile Butadiene Styrene.

- b. Lids shall nest within the top of either the slim line or wide line tote trays creating a seamless horizontal cover, which provides resistance to contamination of the tote trays contents.
 - c. Lids shall permit stacking of several tote trays as well as resist accidental falls due to sliding by an integral nesting system. The top face of the lids shall be designed and manufactured to nest a tote tray no less than 7/32" while still providing a ventilation space below the nested tote tray by use of a series a of eight (8), 7/8" long raised tabs.
 - d. Lids shall be removable from the tote tray while in the tilted position of the patented Glide & Tilt® Structural Runner system.
 - 2. Ticket Windows:
 - a. Optional ticket windows shall be manufactured from random copolymer polypropylene. Ticket windows shall be 1 3/8" high x 4 1/2" wide and securely snap onto the face of the tote tray.
 - b. Ticket windows shall be designed and manufactured to not inhibit the function of the systems other attributes.
 - c. Ticket windows permit the placement of paper labels within the created enclosed area.
 - 3. Inserts:
 - a. Optional modular tote tray inserts shall be manufactured from HIPS, High Impact Polystyrene.
 - b. Inserts shall be 11 1/4" wide x 7 3/4" high x 2 1/2" deep
 - c. Inserts shall be available in 5 different internal configurations (note: dimensions provided are top of compartment)
 - 1) CE4004, Single Division Stortray
 - (a) (1) 7 1/4" x 10 5/8" compartment
 - 2) CE4000, 2 Division Stortray
 - (a) (2) 7 1/4" x 5 1/4" compartments
 - 3) CE4001, 3 Division Short Compartment Stortray
 - (a) (2) 3 3/8" x 5 1/4" and (1) 7 1/4" x 5 1/4" compartment
 - 4) CE4002, 3 Division Long Compartment Stortray
 - (a) (2) 3 3/8" x 5 1/4" & (1) 3 3/8" x 10 5/8" compartment
 - 5) CE4003, 4 Division Stortray
 - (a) (4) 3 3/8" x 5 1/4" compartments
 - d. Inserts shall be designed and manufactured to nest within the slim line tote trays and not inhibit the function of the systems other attributes. Inserts sit on the bottom of the 3" tote trays and on an internal guide rail of the 6", 9" and 12" slim line tote trays. The internal guide rail permits the inserts to glide across top of the tote tray while permitting storage beneath the inserts undisturbed.
 - 4. Filing Frame:
 - a. Optional steel wire filing frame specifically designed for legal sizes files can be provided to be inserted into the 9" or 12" high tote trays enabling products to be designed as an alternative to file cabinets.
- H. Testing and Certifications:
- 1. In addition to above testing certifications, StorSystem products shall meet or exceed the following:
 - 2. StorSystem with Glide & Tilt® Tote Tray Runner System manufactured by Certwood have undergone extensive testing for ergonomics, structural and safety requirements of the appropriate British and European standards and FIRA specifications.
 - 3. Certification confirming the StorSystem Glide & Tilt® Panel Tray Runners CE0010. CE0011 manufactured by Certwood Unlimited has been tested at FIRA International Limited and successfully satisfied the selected test requirements from: BS 5873 - 4: 1998 Test Level H (Selected Tests)

4. Certification confirming StorSystem Storage Tote Trays and Lids (CE1950 SW Single Depth tray, CE1952 SW Double Depth tray, CE1954 SW Quad Depth tray, CE1956 EW Single Depth tray, CE1958 SW Double Depth tray, CE1960CL SW Lid, CE1970CL EW Lid) and StorSystem Glide & Tilt Tray Runners (CE0002. CE0003. CE0004. CE0005. CE0006.) Supplied by Certwood Unlimited has been tested at FIRA International Limited and successfully satisfied the selected test requirements from: BS 5873 - 4: 1998 Test Level H (Selected Tests)
5. Greenguard and Greenguard Gold certified.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation must be performed by manufacturer's authorized representative.
- B. All installations shall be performed in a craftsman like manner. Metal, Tall Storage units shall be installed, level and plumb, securely attached to building with anchorage devices of appropriate type, size and quantity to meet all applicable national, regional and local codes, rules and regulations as well as all printed installation guidelines, specifications and safety requirements. Secure wall units to adjacent structures will applicable clips and anchorage systems to support 300 pounds of weight supported from face of unit.
- C. Inspect and properly adjust all new equipment. If applicable, repair metal scratches with factory provided touch up paint. Remove, recycle and dispose of all packing and wrapping materials off site.
- D. Warranty:
 1. Limited lifetime warranty.

END OF SECTION

SECTION 12 9300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the site improvement work as indicated on the drawings or specified, including but not limited to the following:
 - 1. Bike racks are specified on the contract documents.
 - 2. Flagpoles are specified on contract documents.
 - 3. Site signs are specified in Section 10 1453.

1.3 SUBMITTALS

- A. Submit catalog cuts, clearly identified and shop drawings prepared specifically to show materials, dimensions, installation, procedures and other contract requirements.
- B. Where selection of materials, colors or textures is appropriate, submit samples for selection from manufacturer standards.

1.4 MISCELLANEOUS REQUIREMENTS

- A. Deliver, store, uncrate, handle and install in manner to prevent damage to equipment.
- B. Remove promptly from site all debris resulting from installation of materials and equipment specified herein.
- C. Finish of all materials and equipment shall be appropriate for exterior locations.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. All site improvements shall be as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Site Furniture

1. Location: As indicated on the drawings.
2. Installation: Follow manufacturer's recommendations and applicable guidelines or laws regarding installation unless otherwise noted.
3. Provide for permanent, vandal-proof installation, typical.

END OF SECTION

SECTION 14 2400 - HYDRAULIC ELEVATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Complete hydraulic elevator systems.
 - 1. Passenger type.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- D. AISC 360 - Specification for Structural Steel Buildings.
- E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- F. ASME A17.1 - Safety Code for Elevators and Escalators.
- G. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks.
- H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. NEMA LD 3 - High-Pressure Decorative Laminates.
- L. NEMA MG 1 - Motors and Generators.
- M. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- N. NFPA 70 - National Electrical Code.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- P. PS 1 - Structural Plywood.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
 - 1. Review schedule of installation, proper procedures and conditions, and coordination with related work.
- B. Construction Use of Elevator: Not permitted.

1.4 SUBMITTALS

- A. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car design, dimensions, layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- B. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
 - 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 - 4. Individual weight of principal components; load reaction at points of support.
 - 5. Clearances and over-travel of car.
 - 6. Locations in hoistway and machine room of traveling cables and connections for car lighting, telephone, and _____.
 - 7. Location and sizes of hoistway and car doors and frames.
 - 8. Calculated heat dissipation of elevator equipment in machine room.
 - 9. Applicable seismic design data; certified by a licensed Professional Structural Engineer.
 - 10. Interface with building security system.
 - 11. Electrical characteristics and connection requirements.
 - 12. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- C. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of finish color selection brochures.
- D. Designer's Qualification Statement.
- E. Installer's Qualification Statement.
- F. Testing Agency's Qualification Statement.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Initial Maintenance Contract.
- I. Maintenance Contract: Submit proposal to Owner for standard two year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
 - 1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

- B. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.6 WARRANTY

- A. Provide manufacturer's warranty for elevator operating equipment and devices for two years from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design - Hydraulic Elevators: Schindler Elevator Corporation; 330A.
- B. Other Acceptable Manufacturers - Hydraulic Elevators:
 - 1. Mitsubishi Electric Corp; Hydraulic Passenger Elevators:
www.mitsubishielectric.com/#sle.
 - 2. ThyssenKrupp Elevator; _____: www.thyssenkruppelevator.com/#sle.
- C. Products other than Basis of Design are subject to compliance with specified requirements and approval by the Owner. By using products other than Basis of Design, the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.2 HYDRAULIC ELEVATORS

- A. Hydraulic Passenger Elevator:
 - 1. Hydraulic Elevator Equipment:
 - a. Dual-jack holeless hydraulic with cylinder mounted within hoistway.
 - 2. Service Control Types:
 - a. Standard service control.
 - 3. Interior Car Height: 96 inch.
 - 4. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
 - 5. Rated Net Capacity: 3000 pounds.
 - 6. Rated Speed: 100 feet per minute.
 - 7. Hoistway Size: As indicated on drawings.
 - 8. Interior Car Platform Size: As indicated on drawings.
 - 9. Elevator Pit Depth: 48 inch.
 - 10. Overhead Clearance at Top Floor: 144 inch.
 - 11. Travel Distance: As indicated on drawings.
 - 12. Number of Stops: 2.
 - 13. Number of Openings: 2 Front; 0 Rear.
 - 14. Hydraulic Equipment Location: As indicated on drawings

2.3 COMPONENTS

- A. Elevator Equipment:
 - 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Conform to NFPA 70. Refer to Section 26 0583

2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
 3. Buffers:
 - a. Spring type for elevators with speed less than or equal to 200 feet per minute.
 4. Lubrication Equipment:
 - a. Provide grease fittings for periodic lubrication of bearings.
- B. Electrical Equipment:
1. Motors: NEMA MG 1.
 2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70. Refer to Sections 26 0533.13 and 26 0583.
 3. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
 4. Include wiring and connections to elevator devices remote from hoistway and between elevator machine room. Provide additional components and wiring to suit machine room layout. Refer to Section 26 0583.

2.4 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Conform to ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
- B. Accessibility Requirements: Conform to ADA Standards.
- C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.
- D. Perform welding of steel in accordance with AWS D1.1/D1.1M.
- E. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.
- F. Perform electrical work in accordance with NFPA 70.
- G. Conform to venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction.
- H. Conform to fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction. Refer to Section 21 1300.

2.5 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels and landing indicator panels.
 1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 2. Landing Indicator Panels: Illuminating.
 3. Conform to ADA Standards for elevator controls.
- B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.
- C. Door Operation Controls:
 1. Program door control to open doors automatically when car arrives at floor landing.
 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.

3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.
- D. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).

2.6 OPERATION CONTROL TYPE

- A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
 1. Refer to description provided in ASME A17.1.
 2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
 3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
 4. All "UP" landing calls are made when car is traveling in the up direction.
 5. All "DOWN" landing calls are made when car is traveling in the down direction.
 6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.
 7. Card Access Control System hall activate Operation Control both inside and outside of cab.

2.7 SERVICE CONTROL TYPE

- A. Independent Service Control:
 1. Provide key operated "Independent Service" on car operating panel. Key activation will remove that car from normal operation and cancel pre-registered car calls.
 2. Car will respond to selected floor. Car will not respond to any calls from landing call buttons. Car will only respond to calls placed on the car operating panel. Doors will remain open at last landing requested. Doors will close with a constant pressure on "Door Close" button.
 3. Key activation to normal operation will return car to normal operation.

2.8 EMERGENCY POWER

- A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.
- B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.
- C. Emergency Lighting: Conform to ASME A17.1 elevator lighting requirements.
- D. Provide operational control circuitry for adapting the change from normal to emergency power.
- E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.9 MATERIALS

- A. Stainless Steel Sheet: ASTM A666, Type 304; No. 4 Brushed finish unless otherwise indicated.
- B. Plywood: PS 1, Structural I, Grade C-D or better, sanded.

- C. Tempered Glass: 3/8 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.
- D. Resilient Flooring: Vinyl tile flooring and Resilient Tile flooring, as specified in Section 09 6500.
- E. Plastic Laminate: NEMA LD 3, Type HGS, color as selected by Architect from manufacturer's standard line of colors.

2.10 CAR AND HOISTWAY ENTRANCES

- A. Elevator, ____:
 - 1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
 - a. Hoistway Fire Rating: 2 Hours.
 - b. Elevator Door Fire Rating: 1-1/2 Hours.
 - c. Framed Opening Finish and Material: Brushed stainless steel.
 - d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
 - e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
 - f. Door Operation: Center opening, single speed.

2.11 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car, No. ____:
 - 1. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and _____.
 - a. Panel Material: Integral with front return; one per car.
 - b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.
 - d. Provide following within service cabinet as part of car operating panel:
 - 1) Switch for each auxiliary operational control, keyed.
 - 2) Emergency light.
 - 3) Telephone cabinet and hard-wired connection with telephone.
 - 2. Flooring: Resilient tile.
 - 3. Front Return Panel: Match material of car door.
 - 4. Door Wall: Plastic laminate on plywood.
 - 5. Side Walls: Plastic laminate on plywood.
 - 6. Rear Wall: Plastic laminate on plywood.
 - 7. Hand Rail: Stainless steel, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
 - a. Round, Metal Tube: 1-1/2 inch diameter.
 - b. Stainless Steel Finish: No. 4 Brushed.
 - 8. Ceiling:
 - a. Exposed Frame Suspended Ceiling: Plastic laminate on plywood, mount 7 inch below car canopy with 1-1/2 inch nominal space between edge of ceiling and wall.
 - b. Frame Finish: Color anodized aluminum.
 - c. Lighting: Compact fluorescent downlights.
- B. Car Accessories:
 - 1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
 - 2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1; brass grommets for supports,

covering side and rear walls and front return, with cut-out for control panel; provide one set for each elevator.

- a. Color: Tan.
- b. Provide at least 4 inch clearance from bottom of pad to finished floor.

2.12 MACHINE ROOM FITTINGS

- A. Wall-Mounted Frames: Glazed with clear plastic; sized as required. Provide one chart each for master electric and hydraulic schematic and for lubrication chart. Install charts.
- B. Key Cabinet: Wall-mounted, lockable, keyed to building keying system, for control and operating panel keys.
- C. Monitoring Device Interface:

2.13 FINISHES

- A. Color Anodized Finish: Class I, AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils, 0.0007 inch thick.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.2 PREPARATION

- A. Arrange for temporary electrical power for installation work and testing of elevator components, and conform to requirements of Section 01 5000 - Temporary Facilities and Controls.
- B. Maintain elevator pit excavation free of water.

3.3 INSTALLATION

- A. Coordinate this work with installation of hoistway wall construction.
- B. Install system components, and connect equipment to building utilities.
- C. Provide conduit, electrical boxes, wiring, and accessories. Refer to Sections 26 0533.13 and 26 0583.
- D. Install hydraulic piping between cylinder and pump unit.
- E. Mount machines, motors, and pumps on vibration and acoustic isolators.
 - 1. Place on structural supports and bearing plates.

2. Securely fasten to building supports.
 3. Prevent lateral displacement.
- F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.
- H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- I. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- J. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- K. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- L. Adjust equipment for smooth and quiet operation.

3.4 TOLERANCES

- A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
- B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.5 FIELD QUALITY CONTROL

- A. Testing and inspection by regulatory agencies certified in accordance with ASME QEI-1 will be performed at their discretion.
1. Schedule tests with agencies and notify Owner and Architect.
 2. Obtain permits as required to perform tests.
 3. Document regulatory agency tests and inspections in accordance with requirements.
 4. Perform tests required by regulatory agencies.
 5. Furnish test and approval certificates issued by authorities having jurisdiction.

3.6 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.7 CLEANING

- A. Remove protective coverings from finished surfaces.
- B. Clean surfaces and components in accordance with manufacturers written instructions.

3.8 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to Owner's designated representative.

- B. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, cleaning and maintenance of each component.
- C. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3.9 PROTECTION

- A. Do not permit construction traffic within car after cleaning.
- B. Protect installed products until Date of Substantial Completion.
- C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

END OF SECTION