SUPPLEMENTAL DESIGN GUIDELINES

DISTRICT OF COLUMBIA DEPARTMENT OF GENERAL SERVICES
CAPITAL CONSTRUCTION SERVICES
Version: 2023.12.21

[PROJECT NAME]
[PROJECT ADDRESS 1]
[PROJECT ADDRESS 2]

1. PURPOSE

The purpose of these Design Guidelines is to supplement the technical specifications and provide information to designers, contractors and consultants that may not be found in the technical specifications and owners project requirements. If there is a conflict between these Design Guidelines and the technical specifications and/or owner's project requirements, then these Design Guidelines shall take precedence.

These Design Guidelines shall in no way be interpreted to modify or take precedence over any part of a contract a designer, contractor or consultant may have with the Department of General Services ("DGS").

2. MECHANICAL

2.1. No VRF systems are permitted on school projects unless approved in writing by the DGS Project Manager.

3. ELECTRONIC LOCKDOWN HARDWARE

3.1. No wireless lockdown hardware systems are permitted; all systems MUST be hard wired. DGS will not accept a wireless system as an alternate.

3.2. For school projects, a wired lockdown hardware system must include the following spaces:

- Classrooms
- Academic support spaces
- "Big box" assembly spaces, such as an auditorium, gym or cafeteria.
- Library
- Administrative suite
- Health suite

4. DOORS, FRAMES AND HARDWARE

4.1. Center mullions are required on all double-doors. Mullions must be removable.

4.2. No vertical rods permitted as part of door hardware package are permitted.

4.3. No hollow metal exterior frames are permitted.

4.4. Technical specification section 08 1113 shall be assumed to pertain to INTERIOR use only.

4.5. For school projects, classrooms shall have a storeroom hardware function with no thumb turn and no closers unless required by code.

4.6. All exterior doors shall have card readers.

4.7. One (1) single exterior door shall be hard keyed to provide to building staff.

4.8. Two (2) exterior doors shall be hard keyed for DGS access. One shall be for standard building entry and the other shall be for exterior boiler room access, if such a door exists. If no exterior boiler room door, then only one (1) exterior door shall be hard keyed for DGS access.

4.9. All other exterior doors not keyed per section IV (G) and (H) shall have no cylinders or blank cylinders.

4.10. All mechanical, electrical and IT closets shall be keyed alike.

4.11. ADA push operators must be installed at every main entrance, even if not required by code. Wall mounting of the buttons is preferred; if not feasible, freestanding pedestal may be utilized with Owner approval (see attached spec). Wired is required; if not feasible; a wireless button with adequate signal strength is acceptable.

5. SECURITY

5.1. Two video door stations shall be installed at each facility: one (1) shall be at the main entrance and one (1) shall be at the loading dock area or the kitchen service entrance.

5.2. Door phones (base station) shall be installed at both the security desk and at the main office to respond to the main entrance door station and one in the kitchen to alert staff to deliveries. Only the door phones for the main entrance shall be programmed to remotely unlock the door. Kitchen staff are required to physically respond to door station requests.

5.3. Key tracers are required on all school projects. The KeyTracer device shall be mounted near the main entrance in a public space.

5.4. All access control system elements shall be installed by an RS2 certified vendor. All intrusion detection system elements shall be installed by a DMP or Bosche certified vendor.

6. INTERIOR PLANTINGS

6.1. No interior plantings are allowed.

7. PROJECTORS

7.1. For assembly spaces provide permanent mounted projectors. If the application does not allow for permanent type provide mobile cart with projection screen.

8. ARTIFICIAL TURF FIELDS AND PLAY AREAS

8.1. Painted game lines and striping is not acceptable. All game lines, letters, and logos shall be artificial turf carpet fibers provided in the colors shown on the approved shop drawings.

9. ATHLETIC EQUIPMENT

9.1. Soccer goals shall be equipped with both metal anchors and water weights.

10. SPECIAL WARRANTIES

10.1. The following minimum warranties must be part of the specifications, and, unless otherwise noted, cover installation and manufacturers warranties:

	Minimum General Requirements	Maintenance Contract | Agreement Requirements
Enclosed Switches	2-year installation 2-year manufacturer	
Surge Protection	5-year manufacturer	
Grounding and Bonding for Communications System	20-year manufacturer	
Wireless Access Points	20-year manufacturer	
Audio Visual Systems	Varies per manufacturer	12-month, by-annual inspections Optional 5-year service contract
Intercom and Master Clock System	2-year	12-month, by-annual inspections Optional 5-year service contract
Alarm and Access Control Hardware/ Equipment	2-year	12-month, quarterly inspections Optional 5-year service contract
Telephone and Data Systems	2 years	12-month, quarterly inspections Optional 5-year service contract
VSS and CCTV	2-year	12-month, by-annual inspections Optional 5-year service contract
Poured-in-place Rubber Surfacing	5 years manufacturer	
Turf and Grasses	2-year	Seed 60 days and sod 30 days from Substantial Completion Watering through growing season
Plantings	2 years on District Property 3 years on Public Right-of-way	Watering through end of growth season
Self-Adhering Sheet/ Waterproofing	2 years on installation 5 years manufacturer	
Metal Wall Panels	5 years manufacturer	
Metal Composite Material/ Wall Panels	5 years manufacturer	
Roofing	5 years on installation 30 years manufacturer	
Roofing Insulation	15 years manufacturer	
Green Roof	2-year installation and manufacturer	2-year service contract with minimum of 8-annual visits Optional 5-year single-source warranty including extended overburdened warranty
Aluminum Windows	10-year manufacturer	
Wood Windows	5-year manufacturer	
Laminated Glazing	5-year manufacturer	
Door Hardware	1-year installation 3-year manufacturer	
Flooring	2-year installation Manufacturer varies per product type	
Kitchen Equipment	2-year	2-year refrigeration service

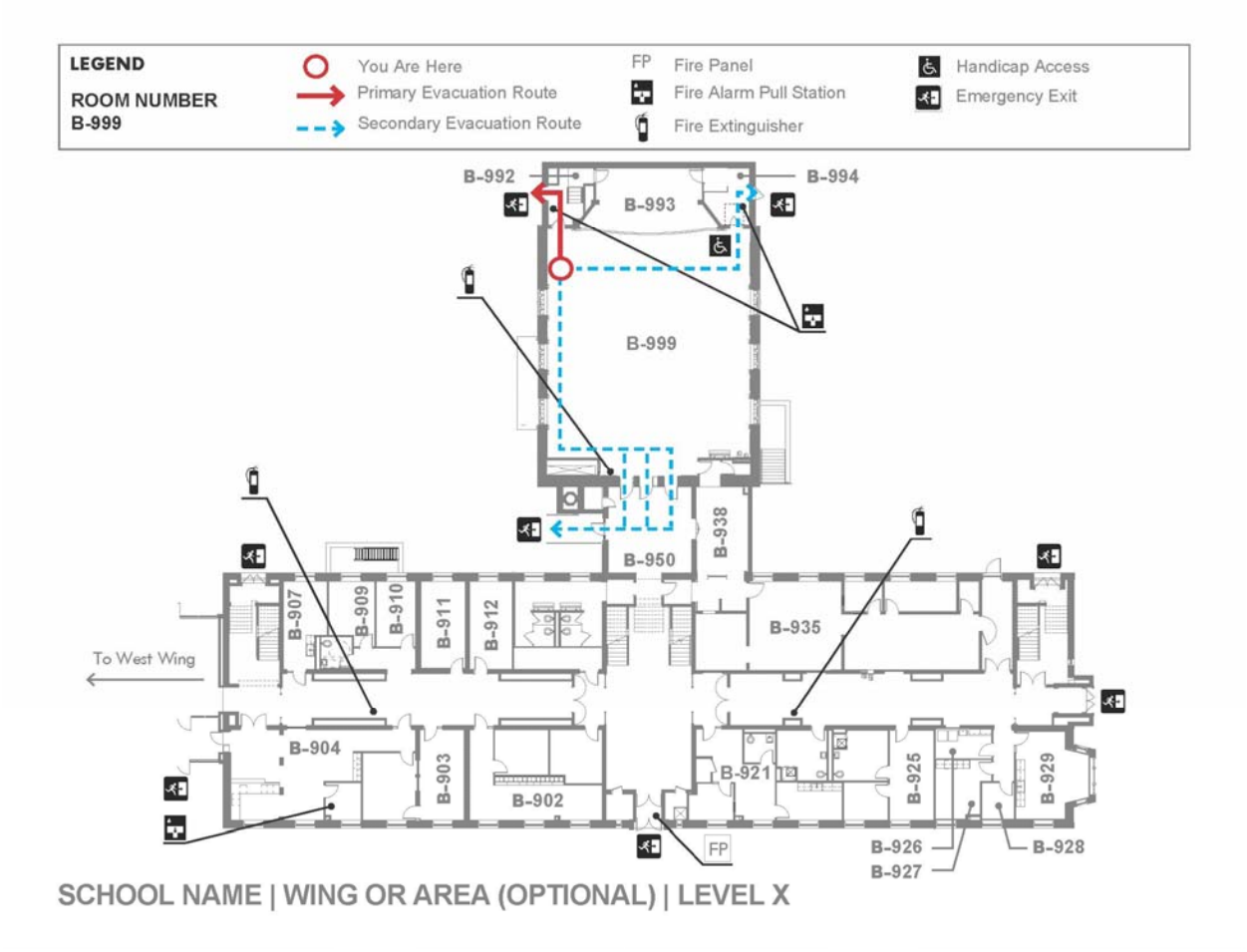
		Follow up demonstration in addition to training requirements 3 months after kitchen
Playground Equipment	2-year installation 5-year manufacturer	
Cabinets and Casework	5-year manufacturer	
Elevators	2-year	12-month
Plumbing Fixtures	5-year	
Mechanical Systems	2-year min. system-wide Manufacturer warranties vary per parts/systems	
HVAC Water Treatment	2-year	1 year including chemical supply
HVAC Compressors	5-year installation 5-year manufacturer	
Heat Exchange Equipment	25-year manufacturer	
Energy Recovery Wheels	5-year manufacturer	
Generator	2-year installation 5 years (?)	
Lighting Controls	2-year installation 5-year manufacturer	
Switchboards	2-year installation 5-year manufacturer	
Panelbaords	2-year installation 5-year manufacturer	
Electricity Metering	2-year installation 10-year manufacturer	
Metal and Ornamental Fencing	10 years	
Electric Charging Stations	1-year installation 3-year manufacturer	Optional 5-year service contract

11. EMERGENCY EVACUATION MAP

11.1. Evacuation maps shall be prepared and furnished per Exhibit A. Any deviation from the standard exhibit shall be approved by DGS.

- Page Layout: Landscape, unless portrait suited better for the overall floorplan
- Min Size: 11” x 8.5”
- Finish: Laminated
- Develop plan for each room/space. Some assembly spaces may require more than 1 plan depending on quantities of egress doors.
- Mounting: Provide surface mounted signage interchangeable inserts

EXHIBIT A – Emergency Evacuation Map



12. FURNITURE, FIXTIRE AND EQUIPMENT

12.1. Kitchen equipment
- No combi-ovens are allowed

13. ATTIC STOCK

13.1. Provide one set of filters adequate for one round of filter changes throughout the facility or campus.

13.2. Attic stock should be kept at a minimal. Coordinate with owner on type and quantity.

14. FIRE ALARM SYSTEMS

14.1. Specify non-proprietary and networkable fire alarm system
- Approved manufacturers: Honeywell and Miracom

- Fire Alarm panels are required to be able to communicate via analog and the IT ethernet network.

14.2. Systems are required to integrate to the network

15. PHONES LINES

15.1. Minimum of five (5) POTS (analog) lines are required at each facility.

16. STANDBY GENERATOR

16.1. Standy generator shall have capacity to power at a minimum below systems and equipment:

- All emergency lighting
- Electrical lockdown system
- Security desk area
- Security panel
- Access control panels
- All receptacles within IT closets
- HVAC Split systems within all IT rooms
- IT Closets (MDF is priority, secondary IDF)
- Elevator shaft lighting and receptacles
- Elevator car lighting & HVAC
- Sump Pumps
- Kitchen Freezer (lighting, heater, alarm, blower coil, compressor rack)
- Kitchen Cooler (lighting, heater, alarm, blower coil, compressor rack)
- Health Suite Refrigerator
- BMS Workstation
- Fire Pump (if needed)
- Main Fire Alarm control panel
- Generator components (battery heater, service receptacles/lighting, etc.)

16.2. Any exceptions to the minimum requirements shall be approved by DGS.

17. PLUMBING

17.1. Sump pump and sewage ejectors in new construction:

- Sump pumps and sewage ejectors are not preferred. If necessary, must be approved by DGS.

18. FOUNDATION AND SUBSURFACE DRAINAGE

18.1. 4-inch perforated 8LF O.C. drain tile is required for below slab under drain system along perimeter. Sump pump is recommended for this application. Coordinate with DGS.

19. EXPANSION JOINTS

19.1. Transition cover plates are required at expansion joints.

19.2. Material selection for the transition cover shall coordinate with the floor finishes.

20. WATERPROOFING

20.1. Drainage boards, protection boards, waterstops, blindside & post-applied waterproofing details:
20.1.1. Below-grade blind-side waterproofing is not preferred. Coordinate with DGS.
20.1.2. Include specification requirements for **early submissions** within 30/60 days of project specific shop drawings, detailing transitions with interfacing building envelope components such Air Barrier, SF-CW window openings, doors and entrances.
20.1.3. Specify required number and frequency of manufacturer site visits at pre-defined stages of construction – to review at commencement substrate preparation; during insulation installation, membrane, penetrations and final inspections prior to backfill/cover up by other envelope components such as brick veneer/panels/aluminum storefronts etc.

21. PLAYGROUND EQUIPMENT AND SURFACIS STANDARDS

21.1. Standards for Poured in place rubber:
21.1.1. The poured in place (PIP) top layer mix shall consist of 100% color granules; no black granules are permitted.
21.1.2. PIP binder shall be aliphatic.
21.1.3. High traffic areas shall have 1 inch wear surface.

21.2. ATM Standards:

- **ASTM F1487** Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.
- **ASTM F2373** Standard Consumer Safety Performance Specification for Public Use Play Equipment for Children 6 Months through 23 Months.
- **ASTM F1292** Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
- **ASTM F2075** Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment.
- **ASTM F2223** Standard Guide for ASTM Standards on Playground Surfacing.
- **ASTM F2479** Standard Guide for Specification, Purchase, Installation and Maintenance of Poured-In-Place Playground Surfacing.
- **ASTM F1951** Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- **ASTM F1816** Standard Safety Specification for Drawstrings on Children's Upper Outerwear.

22. ENERGY DASHBOARD

22.1. Requirements for Energy Dashboard:
22.1.1. Breakdown on energy use submetering unless otherwise specified (for example refer Exhibit D):

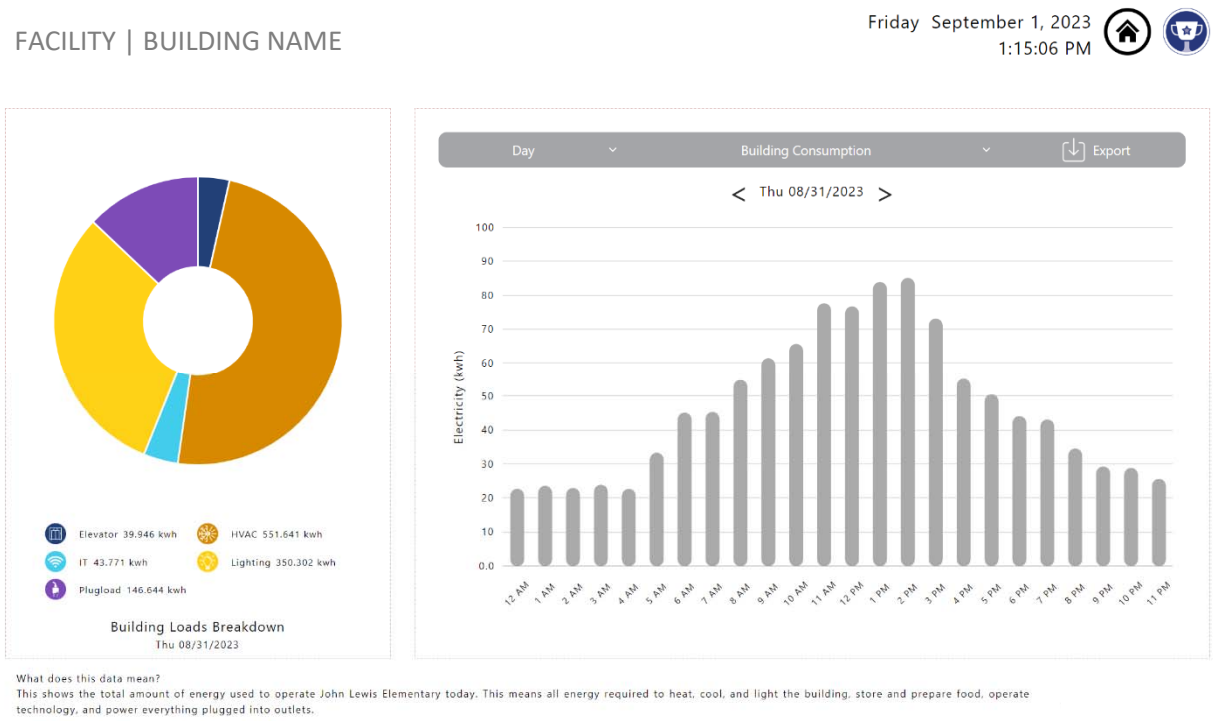
- Total Building KWH
- HVAC KWH
- Lighting KWH

- Plug Load KWH
- Kitchen KWH
- Cafeteria KWH
- Gymnasium KWH
- Large Assembly Spaces: Media Center, Aquatic Facility and similar KWH
- IT, MDF and IDF Rooms KWH
- Renewable Energy KWH

22.2. Water metering for the overall facility

22.3. Energy Dashboard proposed system shall be non-proprietary open-source system. Prior procurement of such systems coordination with DGS and OCTO departments are required for compatibility and maintenance.

EXHIBIT D – Energy Dashboard



OWNER'S MEP PROJECT REQUIREMENTS

DISTRICT OF COLUMBIA DEPARTMENT OF GENERAL SERVICES
CAPITAL CONSTRUCTION SERVICES
Version: 2023.12.21

[PROJECT NAME]
[PROJECT ADDRESS 1]
[PROJECT ADDRESS 2]

1. INTRODUCTION

The District of Columbia Department of General Service (DGS) and DC Public Schools (DCPS) have always made sustainable, high-performance schools for their students a priority. With the introduction of the Clean Energy DC Omnibus Amendment Act of 2018, which targets to increase the Renewable Portfolio Standard to 100% by 2032, and establishes a solar energy standard post 2032, DGS recognizes that its public schools play a considerable part in the District s energy reduction goals.

As the District continues to push its sustainable initiatives even further, with the goal of eliminating all fossil fuel use in public buildings, it is important that DGS, in collaboration with Design Teams, take a critical look at the systems that it designs for all modernized and new school buildings.

This document is meant to serve as a guideline and reference for Project Teams to use in the design of all DGS projects including DC public school facilities, but it is not the only reference material available to teams. The following documents, issued by the Department of General Services and DC Public Schools with each project solicitation, should also be referred to, and considered as complimentary to this OPR:

- Department of General Services (DGS) Division 01 Specifications
- DC Public Schools Educational Specifications
- DGS ADA Compliance Quality Control Manual
- DGS MEP Systems-Commissioning-TAB Quality Control Manual

This document is intended to be used as reference for basis of design for all DGS projects. Any specifications and design recommendations changes shall be coordinated with the client and/or user agency and DGS.

2. SCOPE

2.1 Overview and Definition

The Owner s Project Requirements (OPR) provide an explanation of the ideas, concepts and criteria that are considered to be very important to the Owner, coming out of the programming and conceptual design phases and which are desired to be tracked throughout design and construction. The OPR is developed by the owner, not the design team, but includes an area for the Design Team and Owner to include project specific targets and goals.

The OPR document sets the functional goals that the design is judged against and establishes the basis of the criteria used during construction to verify actual performance. The OPR does not list items that are already required by code. The OPR is generally not a description of what specifically will be included in the project design, but is the more general feature and categorical performance criteria to be met by the design. Where practical and known, the OPR includes measurable indicators used to verify that the performance requirements were met.

The OPR will be followed by the basis of design or design narrative written by the design team and included with design package submissions. The basis of design documents the

primary thought processes and assumptions behind the design decisions and describes the design elements being incorporated to meet the OPR.

2.2 Scope

This document includes requirements for the building systems that are more likely to be included under the formal commissioning umbrella or be impacted by their interactions. For reference, systems not included in this project and OPR that are typically commissioned and should have an OPR developed for them include: process mechanical and plumbing, exterior envelope performance, and other moving mechanical devices.

This document is not a comprehensive project OPR, and does not include all project requirements and directives to the design team which could include: other disciplines such as fire protection, structural, landscaping, civil, geotechnical and other earth work, utilities, Division 01 specification requirements, demolition, all the materials, furnishings and special construction disciplines, drawing, specification and calculation requirements, codes and references, etc.

This document focuses on the mechanical, energy and comfort related systems and on the sustainability requirements of the project. This document does not replace the Commissioning OPR, but rather should serve as a guide in its development.

2.3 Procedures

All products included in this document or the referenced appendix documents are Basis of Design (BOD) only.

2.3.1 Substitutions

Substitutions or deviations can be considered by the Owner on a case by case basis and should be communicated to the Owner and DC Public Schools during Concept or Schematic Design for evaluation and approval. Substitutions requested by bidders after Design Development must be submitted per the Division 01 specification requirements.

Under each area or building system is a list of pertinent questions and data needed to be answered. Blue, indented italicized text indicates the answers to the questions and specific information about the project requirements for this project.

2.3.2 Submittal Review

Submittal requirements outlined in the DGS Division 01 specifications and DGS MEP Quality Control Manual should be followed.

3. GENERAL PROJECT REQUIREMENTS

This section of the OPR is intended for the Owner and Design Team to input project specific information that may assist in the design and scheduling, as well as describe project specific goals and objectives.

3.1 Overall Objectives

Describe this project, including the general overall objectives: Click or tap here to enter text.

3.2 Existing Site Conditions:

Describe any existing conditions of the site that may aid in, or impair, the ability to meet project objectives: Click or tap here to enter text.

3.3 Occupants

What grades / age ranges does the school serve?

- ☐ Early Childhood (0 to 30 months)
- ☐ Pre-Kindergarten (Pre-K3 and Pre-K4)
- ☐ Elementary School (Kindergarten through 5th Grade)
- ☐ Middle School (6th Grade through 8th Grade)
- ☐ High School (9th Grade through 12th Grade)
- ☐ Other Click or tap here to enter text.

3.4 Zoning

What are the floor number and/or building height requirements, and zoning limitations of the site?

Click or tap here to enter text.

3.5 Community Use

What community function / activities must this facility accommodate?

Click or tap here to enter text.

3.6 Energy Efficiency Goals

What are the overall energy efficiency goals and objectives?

- ☐ EUI of Click or tap here to enter text.
- ☐ International Energy Conservation Code Click or tap here to enter text.
- ☐ Energy Star
- ☐ Net Zero Energy (NZE)
- ☐ LEED version: Click or tap here to enter text.; Certification Target: Choose an item.
- ☐ Other Click or tap here to enter text.

3.7 Sustainability Goals

What other environmental goals and requirements are there?

Click or tap here to enter text.

3.8 Schedule

Describe the expected phasing of the project for construction and occupancy:

Click or tap here to enter text.

4. HEATING, VENDTILATION AND AIR CONDITIONING

4.1 Owner s Preferred Building Systems

4.1.1 HVAC System Performance and Design Considerations

The HVAC design must comply with all applicable DC Construction Codes and standards.

Occupant health and thermal comfort shall be provided by HVAC system that must be designed to maintain the thermal and humidity parameters as described in Section 4.5 below.

Outdoor Air (OA) ventilation for the thermostatic zones must be in accordance with latest edition of ASHRAE Standard 62.1: Ventilation for Acceptable Indoor Air Quality .

Historically almost all large central HVAC systems showed poor part-load efficiencies.

In order to reduce annual power consumption and improve building HVAC system energy performance DGS considers de-centralized building HVAC system design approach to be most energy efficient for their new construction and modernization projects.

For a consistent HVAC system energy conservation design, the engineer should consider terminal units in each thermostatic zone/room coupled with Dedicated Outdoor Air System (DOAS) terminals.

Water Source Heat Pumps and Geothermal Heat Pumps are best suited for this application. DOAS unit(s) shall be Direct Expansion (DX) cooling with electric heat and integral total heat recovery equipment.

4.1.2 Water Source Heat Pump (WSHP) System

Geothermal Heat Pumps (GHP) and Water Source Heat Pumps (WSHP) are the preferred HVAC system for both school modernization and new school projects.

- Geothermal Loop: Where acreage, construction phasing, and programming allows, geothermal heat pump systems should be used.

- Cooling Towers:
  - Cooling Towers with remote basins or below grade basins should be used when GHP system is not feasible.
  - Cooling Towers shall be designed such that freeze protection is unnecessary or minimized.
  - Boilers shall be utilized for providing heat to the heat pump hydronic system

4.1.3 Dedicated Outdoor Air System (DOAS)

DOAS unit(s) shall be capable of pre-filtering, pre-conditioning and delivering OA to all school building zones served by WSHP or GHP system. DOAS unit(s) shall operate during occupied mode to meet ASHRAE Std. 62.1 requirements and shall be off during un-occupied mode. DOAS unit(s) shall modulate their respective supply fan(s) and deliver needed amount of OA in response to demand by each individual control zone. Each zone OA quantity demand shall be controlled by the level of CO2 as measured by the zone CO2 censor.

Whenever possible, DOAS units should be located within the building so as to preserve rooftop area for photovoltaics. Acoustic performance of the units so as not to disturb classrooms when located inside the building, or neighbors if located on the roof, are a priority. The highest level of internal acoustical dampening and isolation shall be specified for either instance.

4.2 Potential Alternate Building Systems

4.2.1 Variable Refrigerant Flow (VRF) Systems – not allowed

4.2.2 Variable Air Volume (VAV) system with Hydronic Terminal Reheat

The VAV system with Hydronic Terminal Reheat may be an acceptable alternate for use in select projects with DGS approval. The VAV system represents a central system that is inherently less energy efficient than Water Source or Ground Source Heat Pumps. The design team will need to offset the increased energy use by the VAV system equipment with premium efficiency motors and energy reduction measures elsewhere, or by additional onsite renewable energy sources which has a potential added cost to the project.

4.3 Zoning and Distribution

On projects where the Building Automation System (BAS), connectivity, and enteliWEB® integration allows, the building should be zoned by use and occupancy to the greatest extent possible, to allow for different spaces (floors, wings, cafeterias, auditoriums, gyms, administrative areas, and lobbies) to be programmed to different setpoints and occupancy schedules as appropriate.

Different program areas may require different systems, and each should be evaluated against how it may affect the space available for the program.

4.3.1 Water Source Heat Pump Closets

Water Source Heat Pump units are well suited to academic and administrative spaces. WSHP units shall be ducted type to allow for even air distribution to the spaces served.

- Indoor vertical ducted type water source heat pump units are preferred to large rooftop equipment because it allows more rooftop area to be available for photovoltaic panels. WSHP units shall be placed in a dedicated heat pump closets to allow for easy maintenance access. Heat pump closet quantity and distribution should be carefully evaluated before a decision is made to ensure they are not taking too much interior space away from what is needed to meet the DC Public School Educational Specifications.
- If excess floor space is not available, concealed horizontal ducted type water source heat pumps could be located in the ceiling plenum. Accessibility to above ceiling units should be planned carefully. Heat pumps require routine filter replacement.

4.3.2 Direct Expansion (DX) rooftop systems

Direct Expansion packaged rooftop systems with gas or electric heating can be considered for large program spaces such as gymnasiums, cafeterias and auditoriums. For those systems minimum code required OA will be mixed with return air at the rooftop unit mixed air section.

4.4 Occupancy

4.4.1 Time of day schedules

Buildings will be considered in occupied mode during the standard school day. A school will be set to unoccupied mode for any hours outside of the standard school day, weekends, DC Government holidays, and during scheduled school closures.

The school building occupancy schedule is as follows:

Day of Week	State	Morning	Occupied	Unoccupied	Special Event
School Year Weekdays	On	5:00 a.m.	6:30 a.m.	5:00 p.m.	5:00 p.m.
	Off	6:30 a.m.	5:00 p.m.	5:00 a.m.	10:00 p.m.
School Year Weekends	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	5:00 p.m.
	Off	N/A	5:00 p.m.	8:00 a.m.	10:00 p.m.
Summer Break	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	N/A
	Off	N/A	5:00 p.m.	8:00 a.m.	N/A
Winter Break	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	N/A
	Off	N/A	5:00 p.m.	8:00 a.m.	N/A

The anticipated occupancy schedules per zone are as follows:

Zone	Morning Start	Occupied	Unoccupied	Evening Stop
Administration, Library, Gymnasium, & Cafeteria	6:00 a.m.	8:00 a.m.	5:00 p.m.	5:00 p.m.
Kitchen	4:30 a.m.	6:30 a.m.	1:30 p.m.	2:30 p.m.
Classrooms	6:30 a.m.	8:00 a.m.	3:30 p.m.	4:30 pm
All Other Areas	6:30 a.m.	8:00 a.m.	3:30 p.m.	4:30 pm

4.5 Setpoints

The setpoints outlined below have been developed by DGS and are in alignment with peer municipalities, institutions, and ASHRAE Standard 55-2020: Thermal Environmental Conditions for Human Occupancy. Note these standards only address temperature and relative humidity setpoints for terminal equipment serving various building zones and do not address ventilation requirements. Ventilation equipment is not intended to provide for local comfort changes.

4.5.1 Temperature and Humidity

Heating Season (Starting October 15):

- Occupied Mode:
  - Classrooms and offices shall heat to 70oF DB. Where terminal equipment and controls allow, a comfort band shall be established which provides local adjustments of +/- 2oF
  - Gymnasiums and hallways shall be set to 68oF DB
  - Relative humidity will not be controlled
- Unoccupied Mode:
  - All spaces shall be set back to 55oF

Cooling Season (Starting April 15):

- Occupied Mode:
  - All spaces shall cool to 75oF DB. Where terminal equipment and controls allow, a comfort band shall be established which provides local adjustment of +/- 2oF.
  - Gymnasiums and hallways shall be set to 72oF DB

    - Relative Humidity shall be 50% +/- 10%
- Unoccupied Mode:
    - All spaces shall be set back to 85oF DB
    - Relative humidity will not be controlled

4.6 HVAC Performance Requirements

4.6.1 WSHP units

WSHP and GHP unit s efficiency ratings (CoP and EER) shall meet or exceed values prescribed in ASHRAE Std. 90.1 Chapter 6 and latest adopted edition of International Energy Conservation Code (IECC).

4.6.2 Acoustics

Acoustics is a critical component of creating a successful, high-performance classroom environment. It is as critical that students are able to hear what their teachers are saying without the teacher straining their voice as it is to prevent distractions from noises that come from adjacent spaces, corridors, or equipment. Studies performed on DCPS occupied classroom conditions in non-modernized buildings regularly exceeded the industry benchmark standard AS/NZS recommended levels for acoustics and that even unoccupied conditions failed to meet the requirements for the United States Green Building Council (USGBC) LEED credit for Enhanced Acoustics. However, pre- and post-occupancy studies of DCPS schools have also shown that student and teacher satisfaction with acoustics in the modernized schools continues to remain low after renovation. This could be due to more active, contemporary learning styles that make for a more dynamic and louder learning environment. It is very important therefore to keep any additional background sound from HVAC equipment low, within the recommended dB values.

Acoustics of rooftop equipment should also be carefully considered at school sites located in tight residential communities. The highest level of internal, integral, sound attenuation available for the equipment shall be specified.

Whenever possible, it is DGS preference for major HVAC equipment to be located within the building envelope, so as to reserve rooftop area for photovoltaic panels. However, if building size or other conditions do not allow this, the acoustical qualities of the proposed rooftop equipment will be carefully considered. Water source rooftop equipment is preferred by DGS. It is quieter and requires less sound isolation measures than air source units.

4.7 Indoor Environmental Quality (IEQ)

Over the past few years, wellness has become a common topic of concern and focus in public school modernizations. Recent research performed in conjunction with District of Columbia Public Schools suggests that the Indoor Environmental Quality (IEQ) of a learning space can have a large impact on student and teacher happiness and performance. Measurable components of IEQ include the amount of natural daylight, thermal comfort, acoustics, and air quality. This OPR will focus on two of these: Thermal Comfort and Air

Quality.

4.7.1 Thermal Comfort

Thermal discomfort can cause feelings of fatigue, irritability, and depression. Studies have shown that for every decrease of 1.8-degree F between 77-degree F and 68-degree F, students speed performance on tests was improved from 2-4% in all tasks (D.Wyon & P. Wargocki, Indoor Environmental Effects On The Performance of School Work By Children, ASHRAE, 2007). In a study conducted by the Harvard TH Chan School of Public Health, they found that test scores increased by 4% when the temperature in the space did not exceed the upper acceptable thermal limit.

Learning environments shall be designed that promote thermal comfort and health of the students and faculty. The HVAC system design shall allow for this acceptable temperature range to be maintained, while at the same time being cognizant of the energy use of the building and allowing the spaces to drift in the unoccupied time when students are not present.

Access to natural daylight in the classroom can also have a significant impact on a student s concentration and general wellbeing. Proper daylighting should be studied to ensure that not only is there enough light getting into the space, but also to make sure that there's not too much light, which can lead to unnecessary heat gain within the space, as well as glare problems.

4.7.2 Air Quality

Fresh air is very important to the ability to effectively teach in the classroom settings, and to the cognitive learning of students, and on student attendance. There have been national studies on this effect as well as the independent study performed on modernized and non-modernized DCPS schools. the importance of good indoor air quality on the cognitive learning of students and student attendance.

The ASHRAE 62.1 requirements for ventilation stipulate a maximum CO2 levels for schools at 1000 ppm. Ventilation designs should maintain levels in classrooms and education spaces below the threshold, while also balancing the operation and life cycle costs of required systems to make this an optimal learning environment.

Demand Control Ventilation (DCV)

Demand Control Ventilation (DCV) is an energy-saving control strategy that responds to the actual demand for ventilation in a zone by varying the rate at which outdoor air is delivered to that zone.

Per ASHRAE 90.1-2013 DCV is required for spaces larger than 500 sq. ft. and a design occupancy for ventilation higher than 25 people per 1,000 sq. ft. School classrooms, cafeterias, and auditoriums are all suited for this control strategy.

DCV should be incorporated into HVAC system design so that ventilation air amounts are distributed according to the actual occupant load. Classrooms and all high

occupancy spaces shall include CO2 censors to regulate the amount of fresh air required.

4.8 Maintainability

4.8.1 Access / Equipment Locations

Ease of access is critical for ensuring that routine maintenance takes place, and that equipment continue to operate smoothly.

Water Source Heat Pumps: WSHP are preferred option to rooftop equipment as they are located within the building instead of on the roof. It is preferable that they be installed in closets, with filters located within reach. If floor area is at a premium, it is acceptable to install WSHP in the ceiling plenum. The ceiling should be acoustical ceiling tile to allow for easy access above the ceiling grid and provide acceptable level of noise attenuation from WSHP fans. Identification tags should be provided on acoustical ceiling grid.

Installation of WSHP above drywall ceilings is not preferred, but if necessary, access panels should be sized and located as necessary for maintenance access. Locations of access panels should be included on as-built documentation.

Rooftop Ductwork: The use of exposed duct work on the roof should be limited to the greatest extent possible, for maintenance, longevity, and to preserve as much rooftop area as possible for photovoltaic panels.

Unit Wall Heaters: The use of wall mounted unit heaters in stairwells should be avoided. They are prone to vandalism and large amounts of maintenance.

4.8.2 Identification

Equipment labels and tags shall be visibly located within the room.

4.8.3 Materials

The use of mechanical fittings for refrigerant piping is prohibited.

4.9 Operations and Maintenance Documentation

Refer to the Department of General Services Division 01 specifications for the projects Operation and Maintenance (O&M) documentation requirements.

4.10 Training

Refer to the Department of General Services Division 01 specifications for the project s requirements around training and building turnover.

5. ENTERPRISE BUILDING AUTOMATION SYSTEM (eBAS)

5.1 Remote Monitoring

The BAS system shall allow remote monitoring of all electrical, water, and gas meters and services, as well as allow DGS to remotely control all functional equipment.

The BAS system should be BACnet compatible and follow ASHRAE Standard 135 protocols and be capable of connecting to the DGS enteliWEB® system.

5.2 Thermostatic Zoning Layout

The quantity and layout of a buildings HVAC thermostatic zones has a direct impact on meeting the Owner s energy saving goals and should be carefully considered during the early design phases. It can also assist in increasing the longevity of the building s equipment by only turning on and off parts of systems when occupancy demand needs them. A total of six (6) to twelve (12) zones are reasonable for the public schools depending on site orientation and envelope thermal gain / loss, physical layout of the rooms and program spaces, and occupancy schedule.

5.3 Point Naming Standards

5.3.1 Room Numbering

The Architect shall develop the room numbers and room naming standard in collaboration with the DCPS Design Manager and Project Coordinator during the Schematic Design phase of the project.

The following are the recommended room numbering protocol. This should be confirmed with DGS and DCPS on a project by project basis. Some unique situations may require adjustments to this system.

- The first number shall refer to the floor level (1, 2, 3, etc.). For basement levels, use the letter B.
- If the school has been divided into zones by use (academic wing, athletic wing, etc.) the second position should be reserved for the letter representing that zone (A, B, C, etc.)
- The following 2 digits should refer to the room number (00, 01, 02, etc.). Rooms should be numbered sequentially in a movement around the building agreed to by DCPS and the school administration.
- Rooms within larger program suites should use the same number as the main room, with a letter suffix designation to differentiate it (A, B, C, etc.).

Once approved by DCPS, the approved room numbers shall be distributed to the design team for use in schedules, equipment and controls naming. The Architect shall be responsible for keeping the team updated on any changes to room names or numbers.

5.3.2 Point Naming and Tagging

DGS utilizes Project Haystack as its standard for point naming and tagging. Design teams should utilize the Project Haystack website at www.project-haystack.org. Project Haystack and all of its associated intellectual property is managed as an open source project using the Academic Free License (AFL) 3.0. Anyone is free to participate as long as contributed IP is licensed under the

AFL.

5.3.3 Equipment and Controls Naming Standards

DGS utilizes the GSA Data Normalization standard as a basis for its equipment naming. Controls naming should follow the standards outlined in the DGS Unified Controls Specification.

The Controls contractor is required to get final approval and sign off on the equipment and controls naming from DGS Facilities and Maintenance Division and the DGS Sustainability & Energy Division during the submittal review process.

Refer to APPENDIX B and C at the end of this OPR for the referenced standards.

5.3.4 At Closeout

For projects incorporating enteliWEB®, a copy of the architectural floor plans with final building room names has be provided with the Controls Operation & Maintenance (O&M) manuals required for project closeout. Refer to DGS Division 01 specifications for all closeout requirements.

5.4 Emergency Notifications

Emergency notifications for critical systems shall be automatically generated and distributed via text message or other electronic message delivery service to the appropriate DGS and/or DCPS personnel. The following critical alarm notifications shall be provided:

Equipment:	Event:	Point of Contact:
Kitchen Walk-In Units	Power Failure	DGS First Team
Vaccination / Medication Refrigerators	Power Failure	DGS First Team
Sump Pumps	Power Failure	DGS First Team
Roof Leak Detection	Moisture detection	DGS First Team
Elevators	Power Failure	DGS First Team
Emergency Generator	Failure	DGS First Team

5.5 Local HVAC Control

Local HVAC controls for classrooms and offices need to contain easy to understand labels and/or graphics so teachers and staff can operate them without training. They also need to be durable, and mechanically attached to walls and partitions. Readout on the local control device must accurately match the conditions of the space they are connected to. (i.e. a temperature reading of 72 degrees F should match the physical condition of the air temperature in the space.). It is important that the Building Automation System (BAS) program range, and what the local control

can do, should match.
The following spaces should always be controlled only by the BAS:

- Corridors
- Stairwells
- Gymnasium
- Cafeteria
- Natatorium

Corridors, Gymnasiums, Cafeterias, and Natatoriums may contain keyed or otherwise locked / protected override switches.

6. ELECTRICAL SYSTEMS

6.1 General

The District of Columbia is moving towards eliminating all fossil fuel use in public buildings. This means that there will be an ever-increasing demand on a building s electrical service to provide power for HVAC and water heating systems. It is also important that Design Teams check early in design process that the available electrical service to the building is adequate to support all of the building's electrical needs.

If the electrical service to a site is not sized to support the building loads, PEPCO should be engaged immediately in order to discuss options for a service upgrade.

6.2 Power Monitoring

Metering in the public schools is essential to evaluate the performance of the systems, and to assist with Commissioning, and Net Zero Energy certification efforts. Proper metering also allows the Owner to ensure that billing for different utilities are being properly tracked and distributed to responsible parties.

All meters should be integrated with the eBAS.

6.2.1 Campus Level Metering

Campus Level Metering should be considered for project sites that will have multiple agencies or tenants using the premises, and separate utility billing is required.

Some site amenities, such as Electric Vehicle (EV) charging stations, or recreational pools and splash pads, require separate metering for use tracking and billing.

In some instances, running separate utility services to the site may be preferable to campus level metering. The Design Team should engage DGS during the Concept and Schematic Design phases to discuss the options and decide what makes the most sense for the Owner s billing and tracking needs.

6.2.2 Whole Building Meters

Whole Building Metering should be used for:

- Incoming Electrical Service
- Domestic Water Service
- Gas Service
- On-site Renewables
- Emergency Natural
- Gas Generators

On-Site Renewables: Metering of on-site renewables, such as photovoltaic panels and wind turbines, allows DGS to be able to compare the actual amount of power generation at each site against what is being billed. Metering of renewables should be compatible with the LOCUS software platform which connects via API to meters. On-site renewables that should be metered include:

Emergency Natural Gas Generators: Metering of emergency natural gas generators is a requirement of the net zero energy certification process, to allow for the separate tracking of gas use for emergency purposes versus general building use.

6.2.3 Single-Point Sub-meters

Single-Point Submeters are used by DGS to evaluate the efficiencies and performance trending of specific portions of, or equipment used in, the building s systems. Data from single-point meters should be able to be pulled in the Owner s enteliWEB® platform.

The following components should be sub-metered, with the specified tracking intervals:

- Central Plant Chillers: GPM (Gallons per minute), Supply / Return Water Temperature (Degrees F), BTU per hour at 15-minute interval
- Cooling Tower Make-up Water: GPM at 5-minute intervals and totalized gallons must be stored
- Cooling Tower Blow Down (as required by jurisdiction):Totalized gallons must be stored
- Boilers: BTU per hour at 15-minute intervals
- Geothermal Well Field Generation: BTU per hour at 15-minute intervals
- Domestic Hot Water: Totalized Gallons per day
- Recirculation Pumps: GPM at 15-minute intervals
- Hose Bibs: GPM at 5-minute interval
  - Discuss the need for hose bib metering with DGS prior to including, as this is not typical, but may be required depending on site location and security
- Site Water Features (make-up water): GPM at 5-minute intervals and totalized gallons must be stored for at least a year
- Interior Lighting: kWh used per day, week, month must be stored for at least a year
- Exterior Lighting: kWh used per day, week, month must be stored for at least a year
- Plug Loads: kWh used per day, week, month must be stored for at least a year

6.2.4 Branch Circuit Submeters

Branch circuit sub-metering is required where the Owner desires to track the energy use and performance of either specific areas of the building, or systems across the entire building. The following branch circuit sub-meters should be included:

- Kitchen Electrical
- Building Plug Loads

- Interior Lighting
- Exterior Lighting - Single point sub-meters may be required by DGS to track security, parking, and athletic field lighting separately. Project Teams should coordinate needs with the DGS and DCPS project management teams.
- IT Loads (MDF/IDF) HVAC Loads
- Domestic Water Heating

6.3 Lighting

6.3.1 Lamps

All interior and exterior lighting should be LED.

6.3.2 Locations and Access

Lights in Gymnasiums, Natatoriums, Atriums, and over Auditorium fixed seating are hard to access and provide maintenance issues for DGS. Lifts to reach high bay areas in occupied schools are not always available, so light fixture access for occasional maintenance should be carefully considered in these situations. Whenever the option is available, remote drivers for high bay and difficult to reach lights should be used, with the drivers installed in readily accessible locations.

For pendent fixtures, the following mounting heights should be observed:

- Elementary Schools: minimum of 8’- 6” AFF to bottom of light fixture
- Middle &High Schools: minimum of 9’- 0” to bottom of light fixture

6.3.3 LED Temperature

Lights in the 5000K range are optimal for the majority of school related tasks requiring high levels of focus and concentration.

The ability to tune the color temperature in classrooms to specific tasks and activity can benefit the learning environment. Higher temperatures around 5500K can assist with concentration during testing, and when engaged in math and science activities. Lower temperatures in the 4000K range are recommended during group activities and classroom discussions. Even lower settings, around 3000K, help to calm students down after stimulating activities such as gym, lunch, and recess.

The design team should discuss the potential use of color tuning lighting with DGS and DCPS during the Concept and Schematic Design phases of the project, to determine which program areas could benefit the most from its use.

6.3.4 Lighting Levels

Required average maintained light levels for this project are listed below. For spaces not listed, the current IESNA light level recommendations shall be followed.

- Classrooms: 35 FC at desk level
- Offices: 35 FC at desk level

- Lobbies: 20 FC
- Corridors and means of egress: 20 FC while occupied. Gradual dimming to 10 FC allowed with input from daylight and occupancy sensors.
- Conference rooms: 35 to 50 FC
- Group Toilet Rooms and Locker Rooms: 30 FC
- Mechanical / Electrical Rooms: 35 FC
- Science Labs & Prep Rooms: 50 to 75 FC
- Art Rooms: 50 to 75 FC
- Instrumental Band Rooms: 50 to 75 FC
- Gymnasiums: Elementary / Middle School = 50 FC, High School = 80 FC
- Fitness Rooms: 20 to 30 FC
- Exterior lighting at building entrances, walkways, and parking lots: 2 to 5 FC

6.3.5 Lighting Controls

Central lighting control systems should be universal and non-proprietary. The system should be BACnet compatible, and able to connect to DGS enteliWEB® system. Cellular communication will not be accepted.

Local lighting control systems should be user friendly, with easy to understand words or symbols on the light switch faceplates.

6.3.6 Sequence of Operations Local Lighting Controls:

Space Type:	Main Switch @ Primary Door:	Secondary	Occupancy Control	Specialty
Auditorium House Lights	ON / OFF RAISE/LOWER	N/A	Manual ON, Vacancy Sensor OFF	
Classroom	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Cafeteria	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Conference Rooms	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Gymnasiums **	ON / OFF	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Library	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting

Offices	At Door: ON / OFF RAISE/LOWER	N/A	Manual On / Vacancy Off 15 minutes	Daylight Harvesting
MEP Closets	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A
Storage (General)	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A
Toilets Single User	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A

** Alternative See Central Lighting Controls

6.3.7 Sequence of Operations Central Lighting Controls

All interior lighting shall be turned off in any area that will be unoccupied for more than fifteen (15) minutes, except in corridors, stairwells, and exits as required by DCPS or the building code.

Space Type:	
Auditoriums	As the program requires.
Corridors	Control via time clock, with local key switch override located in corridor. Non-key switches allowed if located in a staff-controlled space (i.e. at Welcome Center desk). Lights should turn on with security alarm signal.
Exterior - Building	Controlled via astronomical time clock with photosensor override
Exterior Fields	Controlled via time clock. Include remote control capabilities.
Exterior - Parking	Controlled via astronomical time clock with photosensor override.
Gymnasium	Control via time clock, with local key switch override located in gymnasium. Lighting for after-hours use and special event will have to be scheduled with the DGS. Alternative see Local Control options.
Locker Rooms	Night Lights with Occupancy Override: Emergency lighting always on 24/7 to provide a minimum average lighting level of 15 FC. Occupancy sensor near entrance turns all lights on. Lights return to night light mode after 15 minutes of no activity.
Toilets Group	Night Lights with Occupancy Override: Emergency lighting always on 24/7 to provide a minimum average lighting level of 15 FC. Occupancy sensor near entrance turns all lights on. Lights return to night light mode after 15 minutes of no activity.

Exterior decorative lighting is defined as lights that are not part of the building s security lighting at building entrances and exits, or illuminating the parking lots. It may be used to accent walkways or plazas, or for accenting landscape features. Decorative lighting should be circuited and programmed so whereas it may all come on at the same time via a time clock, it can be controlled and turned off separately depending on location.

6.4 Emergency Generator and UPS

The following equipment and systems are required to be connected to the emergency generator:

- All emergency lighting
- Classroom electrical lockdown hardware
- Security desk power and data
- Security panel
- Building Access panel
- All receptacles within IDF and MDF closets
- Cooling system for IDF and MDF closets
- MDF closet
- IDF closet (if possible)
- Elevator shaft lighting and receptacles
- Elevator car lighting and HVAC
- Sump pumps
- Kitchen Freezer (Lighting, heater, alarm, Blower coil, Compressor, and Glycol Racks) Kitchen Cooler (Lighting, heater, alarm, Blower coil, Compressor, and Glycol Racks) Health Suite Refrigerator(s)
- BAS Workstation
- Fire Pump (if needed)
- Main Fire Alarm Control Panel
- Generator components (battery heater, service receptacles / lighting, etc.)

6.5 Solar Power

6.5.1 Power Purchase Agreements

The District of Columbia s Net Zero Energy targets have made photovoltaic panels a necessity on all public buildings.

Typically, the cost of procuring and installing PV would be too high for most public school modernization budgets to support. In the District of Columbia photovoltaic panels are provided on DC Public School projects at no cost thanks to Power Purchase Agreements, or PPAs, between the District of Columbia and local utility providers. The design, procurement, and installation of the PV system is handled entirely by a third-party vendor.

6.5.2 3rd Party Photovoltaic Consultant

Since the design and installation of the PV is outside of the scope of the Design-Build team, it is important that the engineers engage with DGS 3rd Party Photovoltaic Consultant early in the

design process. The DGS consultant oversees the solicitation process and implementation of DGS photovoltaic projects, and can assist teams in evaluating available rooftop area, assessing the efficiency of proposed panel layouts, and assist in calculating a system predicted energy production.

An energy model must be provided to DGS and their 3rd Party PV consultant at the time of the PPA procurement for their project, especially for any school modernizations that include a net zero energy certification mandate in the RFP.

6.5.3 Rooftop Coordination

There are many items that compete with PV panels for space on a roof, such as HVAC equipment, vent penetrations, drains, and fall arrest anchors. Roof top equipment and penetration should be limited to the greatest extent possible. PV layout should be coordinated around roof drains so as not to impede the flow of water, but to also allow access to the drains for routine maintenance.

If an existing roof is to be reused, the structural engineer should evaluate the existing structure to determine if it can support the added weight of a ballasted PV system. If an existing roof is not capable of bearing the weight, or the total roof area is not adequate to meet the power production offset required, site mounted PV panels can be considered.

6.5.4 Project Responsibilities & Costs

The Design-Build team is required to provide dedicated space within the building for the future PV panels, transformers, and inverters, as well as provide the necessary conduit between the equipment and the PV locations. A dedicated breaker for the PV system should also be included in the main switch panel.

If site mounted photovoltaics are required, the design, engineering, and construction cost of the site structures or trellis required to support the panels is the responsibility of the Design-Build team and must be accounted for in the project s budget. Similar for any secondary framing required to attached photovoltaic panels to building mounted canopy or sunshade structures. The Power Purchase Agreement only covers the cost and installation of the PV panels themselves.

6.6 Execution

6.6.1 Raceways

In all areas without ceilings and exposed to the structure above, all wire management shall be controlled through raceway trays.

6.6.2 Electrical and Network Labeling

All electrical outlets, including those in systems furniture, shall be labeled with corresponding electrical panel and breaker numbers.

All network outlets, including those in systems furniture, shall be labeled with the corresponding closet, patch panel and termination location.

6.6.3 Color Coding

- HVAC controls cabling shall be yellow
- Network cabling shall be blue
- Wireless access point cabling shall be orange

7. PLUMBING SYSTEMS

7.1 Coordination with PV Systems

Although the procurement and installation of the PV system is not part of the project scope for school modernizations, the Design-Build team shall provide proposed photovoltaic panel layouts for review by the DGS 3rd Party Photovoltaic Consultant. The layouts should be carefully considered and coordinated so as not to inhibit the flow of stormwater to roof drains, nor to block maintenance access to main or overflow drains.

7.2 Domestic Water

7.2.1 Efficiency

All water fixtures shall be Water Sense Certified

7.2.2 Controls

The outlet temperatures on domestic-water heaters shall be monitored by the Building Automation System (BAS).

7.2.3 Plumbing Fixtures

Refer to APPENDIX A for Plumbing Fixture Basis of Design Schedule. Plumbing fixtures and accessories shall meet the District of Columbia s accessibility guidelines for public schools where required.

Lavatories

- Multi-station lavatory units are preferred in group toilet rooms over single wall hung units. Preferred number of stations per sink is three (3) whenever possible.

Sinks

- Undermount sinks are preferable. If set in sinks are used, countertop design should account for height of sink rim. ADA measurers height of sink from finished floor to sink rim, not countertop.

Faucets

- Battery powered automatic sink faucets are not acceptable to DGS. The batteries are hard to procure, and therefore do not get replaced frequently. Manual metered faucets eliminate the issue with the batteries, but can be difficult for some smaller children (and adults!) to push to operate. Whenever possible, hardwired automatic faucets should be used.

Water Closets

- Mounting Heights:
  - Pre-K3 and Pre-K4 on-suite toilets: floor mounted with top of seat located 13 inches AFF
  - Kindergarten and 1st Grade toilets: wall mounted with top of seat located 15 inches AFF
  - All other locations other than ADA: Wall mounted with top of seat located 18 inches AFF
  - ADA toilets: per the ADA Guidelines

Urinals

- Waterless urinals shall not be allowed.
- Pint urinals shall not be allowed. The small amount of water utilized is not adequate to prevent buildup in the system, which leads to larger maintenance issues.

Showers

- Design Teams should avoid the use of pre-fabricated shower units and basins. Small-sized ceramic tiled shower basins set into recessed slabs (when possible) are preferred. Carefully coordinate drawings to ensure ADA clearances are met.
- Shower mixing valves shall be fully accessible from inside of the shower stall.

Drinking Fountains

- Drinking fountains should be provided at all major corridors. At ADA fountain locations, design should provide ADA apron below fountain or other acceptable construction that provides cane detection.
- All drinking fountains shall include a bottle filler. Bubblers should be located at all classroom sinks.

Mop Sinks

- Teams should avoid the use of prefabricated mop sinks whenever possible.

7.2.4 Toilet, Shower, and Custodial Accessories

Refer to APPENDIX A for DCPS approved toilet, shower, and custodial accessories.

7.3 Identification

7.3.1 Labels

Identification for equipment and valves shall be visibly located within the room.

7.3.2 Abbreviations

Refer to the APPENDIX for equipment and controls naming standards.

8. PROJECT CLOSEOUT

Refer to the DGS Division 01 specifications for the full extent of all project closeout requirements and procedures.

8.1 Drawings

The following drawings should be provided in the designated DGS Office within each school:

- Laminated 8.5 x 11 MEP equipment schedules with all makes and models listed.
- Laminated 24 x 36 (minimum) MEP floorplans with accurate building room numbers that correspond to all equipment and control schedules.
- Laminated 8.5 x 11 valve schedules with corresponding valve locations Laminated 24 x 36 (Minimum) HVAC sequence of operations

---END of OPR---

APPENDIX A: PLUMBING FIXTURE SCHEDULE

This appendix is intended to be used as reference for basis of design for all DGS projects. Any specifications and design recommendations changes shall be coordinated with the client and/or user agency and DGS.

Multi-station Lavatory Unit

- Basis of Design: Bradley Corporation, Verge LVL Series

Faucets

- Multi-User Restrooms
  - Basis of Design: American Standard Metering Faucets, Centerset Spout
- Single-User Restrooms
  - Basis of Design: Monterrey by American Standard, Two-Handle Centerset Lavatory Faucet

Mop Sinks

- Faucet
  - Basis of Design: Service Sink Faucet by T&S Brass and Bronze Works, with 4 Wrist Action

Toilets

- Pre-K3 and Pre-K4 on-suite toilets:
  - Basis of Design: Baby Devoro FloWise by American Standard, with round front
- Typical Toilet (all other grades/ages):
  - Basis of Design: American Standard Elongated Wall Hung Closet Fixture

Urinals

- Basis of Design: American Standard Washbrook Urinal

Flush Valves

- Pre-K3 and Pre-K4 on-suite toilets:
  - Basis of Design: Sloan Flushometer 111-1.28
- Typical Toilet (all other grades / ages):
  - Basis of Design: Sloan Manual Exposed Flushometer
- Urinals
  - Basis of Design: Sloan Manual Exposed Flushometer

Drinking Fountains

- Interior Drinking Fountains:
  - Basis of Design: Elkay Enhanced EZH20 Bottle Filling Station & Versatile Bi- Level ADA Cooler
- Exterior Drinking Fountains
  - Basis of Design: Elkay Outdoor EZH20 Bottle Filling Station Bi-Level Wall mount LK4409BF, or Elkay Outdoor EZH20 Pedestal mount LK4420BF1U

Toilet, Shower and Custodial Accessories

- Soap Dispenser
  - Basis of Design: ClearVu Bulk Foam Soap Dispenser 9345
- Toilet Paper Dispenser
  - Must accommodate a 9 inch bulk roll (single or double)
  - Basis of Design: Bobrick - 2892

- Paper Towel Dispenser for Pre-K3 and Pre-K4 on-suite restrooms, and classroom sinks only.
  - Must accommodate an 8 inch paper towel roll.
  - Basis of Design: Bobrick B-72860
- Hand Dryers
  - Hand dryers shall be provided at all other locations other than the Kitchen.
  - Located in all toilet rooms except the Pre-K3 and Pre-K4 on-suite restrooms.
  - Basis of Design: Dyson Airblade V
- Partition-Mounted Sanitary Napkin Disposal
  - Double-sided serving two toilet compartments:
  - Basis of Design: Bobrick B-354
- Single-sided
  - Basis of Design: Bobrick B-254
- Surface-Mounted Soap Dish
  - Locate below all liquid soap dispenser to collect drips
  - Basis of Design: Bobrick B-6807 (Satin-finish stainless steel)
- Shower Curtain Rod
  - Bobrick Extra-Heavy-Duty Shower Curtain Rod, B-6047
- Grab Bars
  - Basis of Design: Bobrick Stainless Steel Grab Bars with Snap Flange, B-6806
- Shower Seat
  - Basis of Design: Bobrick Bariatric Folding Shower Seat with Legs, B-918116 Series
- Mop / Broom Holders
  - Basis of Design: Bobrick Utility Shelf with Mop/Broom Holders and Rag Hooks, B-239
- Mirrors in Toilet Rooms
  - Basis of Design: Bobrick Glass Mirror with Stainless Steel Angle Frame, B-290
- Baby Changing Stations
  - Basis of Design: Koala Kare Horizontal Recessed Mounted Stainless Steel Station, KB110-SSRE
- Napkin / Tampon Vendor
  - Basis of Design: Bobrick Recessed or Semi-Recessed Napkin / Tampon Vendor, B- 3706T (Token Operation)
  - Due to changing District code requirements, Design Teams should confirm with DCPS at ti2me of specifying if current DCPS standards require Token or Free operation.

APPENDIX B: EQUIPMENT & CONTROLS NAMING STANDARDS

GSA Data Normalization for Building Automation Systems:

The Project Team should procure a copy of the current GSA Data Normalization document prior to beginning design. A copy may be provided here by DGS when available.

Project Haystack

Design teams should utilize the Project Haystack website at www.project-haystack.org. Project Haystack and all of its associated intellectual property is managed as an open-source project using the Academic Free License (AFL) 3.0. Anyone is free to participate as long as the contributed IP is licensed under the AFL.

APPENDIX C: CONTROLS NAMING STANDARDS

DGS Unified Controls Specification

SECTION 06 2000

FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Cabinets with plastic laminate finish and related hardware.
   2. Counter and vanity tops fabricated from solid surfacing.
   3. Shelving.
   4. Standing and running trim, including bases, with field painted finish.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 09 Section PAINTING AND COATING for field applied painting systems.

B. See Division 12 Section LABORATORY CASEWORK for manufactured casework.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for materials specified.

B. Shop Drawings:
   1. Submit Shop Drawings of finish carpentry showing location of each item, dimensioned plans and elevations, large scale details and joints.
   2. Include hardware catalog cuts and schedule.

C. Samples:
   1. Plastic laminate and solid surfacing: For colors not indicated on Finish Schedule on Drawings, submit manufacturer's full range of standard color and texture samples.

1.4 DEFINITIONS

A. Exposed Surfaces: Surfaces visible when doors and drawers are closed; bottoms of casework more than 4'-0" (1200 mm) above finished floor, backs of hinged doors and edges of hinged doors exposed when opened.

B. Semi-Exposed Surfaces: Surfaces that become visible when drawers and doors are opened, tops of cases 6'-6" (1950 mm) or more above finished floor.

C. Concealed Surfaces: Surfaces not visible after installation.

1.5 SYSTEM REQUIREMENTS

A. Fire Resistance Requirements: Treat those items required to be treated by authorities having jurisdiction over Work, and those items indicated as "Fire Retardant Treated Wood".

B. Interface with Other Systems:
   1. Coordinate Work with that of other trades affected by this installation.
   2. Coordinate with electrical, plumbing and other fixtures mounted within, or adjacent to woodwork and requiring access. Provide required openings using manufacturer's templates and field measurements to verify actual installed locations and dimensions.

1.6 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications:
   1. Not less than 5 years documented, successful experience with work comparable to Work of this Project.
   2. Woodwork shall be installed by manufacturer.

B. Reference Standards: Comply with applicable provisions and specified sections and grades of AWI "Architectural Woodwork Standards".

1.7 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work, especially verification of in-wall wood blocking/structural support systems at finish carpentry and cabinetry mounting locations.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver finish carpentry Work to building after concrete, masonry and other Work involving wet materials have been completed for at least 10 days, when areas are ready to receive Work, and only after temperature has been stabilized in installation areas at approximate level which will prevail in building when occupied.

B. Protect finish carpentry Work against damage during handling, transit and storage.

C. Store in dry, clean, well ventilated place, protected from dampness, moisture and weather.

1.9 PROJECT CONDITIONS

A. Verify dimensions before proceeding and obtain measurements at job site for Work required to be accurately fitted to other construction.
   1. Measurements shall be accurate so that finished Work is precisely assembled and fitted.
   2. Verify locations of concealed blocking, nailers and furring that support finish carpentry, before partitions are enclosed.
   3. Record measurements on final Shop Drawings.

B. Remedy unsatisfactory tolerances in adjoining Work.

C. Proceed with finish carpentry Work only after substrate construction and penetrating Work have been completed.

D. Environmental Requirements:
   1. Obtain temperature and humidity requirements for woodwork installation and storage areas from woodwork manufacturer.
   2. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
   3. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Softwood Lumber:
   1. Concealed blocking for finished carpentry: Douglas fir "C Select"; or equivalent WWPA softwood or better.
   2. Exposed blocking or blocking within walls: No. 1 Common; Douglas fir or Southern pine.
   3. Provide kiln dried lumber with average moisture content of 6% to 11%.

B. Panel Products:
   1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
   2. Plywood:: APA INT C-C.
   3. Core material for use under plastic laminate: Comply with ANSI A208.1.
      a. Provide particleboard core for cabinet doors and for adjustable shelves.

C. Plastic Laminate:
   1. Description: High pressure laminates, complying with NEMA LD3 and AWI 200-S-10. Provide the following grades:
      a. Exposed vertical surfaces: High pressure GP-28 (0.028 inch nominal thickness).
      b. Exposed horizontal surfaces: High pressure GP-50 (0.028 inch nominal thickness).
      c. Thermoset decorative overlay (melamine).
   2. Finish: Matte.
   3. Color: As indicated on Finish Schedule on Drawings.
   4. Adhesive: Clear drying type recommended by laminate manufacturer.

D. Solid Surfacing Material:
   1. Description: Homogenous, mineral-filled acrylic and polymer resin, complying with NEMA LD3 and with the following physical properties:
      a. Tensile strength: Minimum 3900 psi (26.9 MPa), when tested in accordance with ASTM D638.
      b. Hardness: Minimum 56 Barcol, when tested in accordance with ASTM D2583.
      c. Water absorption: Maximum 0.04% for 3/4 inch (19 mm) thickness, when tested in accordance with ASTM D570.
   2. Colors and finishes: As indicated on Drawings.
   3. Thickness: 3/4 inch (19 mm), unless otherwise indicated.

4. Adhesive: Type as recommended by solid surfacing material manufacturer.
5. Acceptable products and manufacturers:
   a. Corian Solid Surfaces by DuPont.

2.2 HARDWARE

A. Comply with ANSI/BHMA A156.9.

B. Hinges:
1. Concealed door hinges:
   a. Concealed hinges for overlay doors, 110 deg opening with integral horizontal and vertical adjustment; self-closing; for full-overlay doors.
   b. Finish: Manufacturer's standard bright nickel.
   c. Acceptable product and manufacturer: Equivalent to Duomatic Hinges by Häfele America Co by Häfele America Co.
2. Hinge quantity schedule:

Height (Max.)	Width (Max.)	No. of Hinges
30 inch (750 mm)	24 inch (600 mm)	2
30 inch (750 mm)	36 inch (900 mm)	3
36 inch (900 mm)	24 inch (600 mm)	3
36 inch (900 mm)	36 inch (900 mm)	3
48 inch (1200 mm)	24 inch (600 mm)	4

C. Drawer Slides:
1. Description: Ball bearing slides.
2. Mounting: Side.
3. Load capacity:
   a. Desk drawers: 100 pounds (45 kg) per pair.
   b. Bins and file drawers: 150 pounds (70 kg) per pair.
4. Extension:
   a. Desk drawers: Three section, full extension.
   b. Bins and file drawers: Three section, full extension.
5. Finish: Manufacturer's standard electro-plated zinc.
6. Acceptable products and manufacturer:
   a. Desk drawers: Equivalent to 3832 Slide Series by Accuride.
   b. Bins and file drawers: Equivalent to 4034 by Accuride.

D. Pulls:
1. Description: As indicated on Drawings.
2. Finish: As indicated on Drawings.
3. Acceptable product and manufacturer: Equivalent to systemhandle No. 7842, by Systemhandle.

E. Shelf Support Pins:
1. Description: Nickel-plated spoon shaped pins for support for adjustable shelves, inserted into 1/4 inch (6 mm) diameter holes drilled at 3 inches (76 mm) on center in sides of cabinet.
2. Acceptable product and manufacturer: Equivalent to Metal Shelf Supports, Steel Ø1/4", Spoon-Shaped by Häfele America Co.

3.

F. Locks:
1. Description: Standard pin type or disc type (5 pins or discs) tumbler locks, keyed individually except as otherwise indicated.
2. Finish: As selected by Architect from the manufacturer's full range.
3. Locations: Provide for each door and each drawer.

G. Grommets:
1. Description: Plated steel cap fitting flush with top of work surface, seating into black oxide finish sleeve (liner) with concealed spring fastener; 3 inch (76 mm) diameter with two 2 slots.
2. Color: As selected by Architect from manufacturer's full standard range.
3. Acceptable product and manufacturer: Equivalent to PS-3C by Doug Mockett & Company, Inc.

H. Miscellaneous Hardware: Provide other required hardware as indicated and as required for complete and proper operation and installation of units.

2.3 ACCESSORIES

A. Provide miscellaneous steel support angles and plates as required for complete installations.

2.4 FABRICATION

A. General:
1. Comply with referenced AWI standards.
2. Provide details and profiles indicated.
3. Field verify all conditions prior to fabricating finish carpentry.
4. Fabricate units rigid, neat, free from defects, warp or buckle in accordance with final Shop Drawings.
5. Provide factory cutouts for openings in units as required to receive associated Work.
6. Premachine units at factory to receive hardware using hardware manufacturer's templates.
7. Assemble units at factory and disassemble only as required for shipping to site. Accurately mark units for assembly at site.

B. Standing and Running Trim:
1. Comply with AWI, Premium Grade.
2. Fabricate from hardwood solid stock material for opaque finish as indicated.
3. Groove or kerf backs of flat trim. Do not let grooves and kerfs show on exposed ends of finished Work.

C. Cabinets:
1. Comply with AWI, Custom Grade.
2. Fabricate from solid stock material for opaque finish and panel material for plastic laminate finish.
3. Apply edge sheets prior to applying face sheets to doors., unless otherwise indicated.
4. Provide dust panels of 1/4 inch (6 mm) thick plywood or tempered hardboard above compartments and drawers, except where located directly under tops.

5. Prepare units for hardware and install at factory where practical.

D. Countertops and Vanity Tops:
1. Solid surfacing tops:
a. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Reinforce with 2 inch wide strip of solid surfacing material.
b. Provide factory cutouts for fixtures and fittings as indicated on Drawings.
c. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges.

2.5 SHOP FINISHING

A. Shop Priming:
1. Apply sealer and first finish coat on surfaces requiring field finishing, except millwork requiring field fabrication.
2. Back paint concealed surfaces with one coat of oil base wood primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blocking and Furring:
1. Provide surface-mounted wood blocking, nailers, furring and grounds on partitions, located as required for wall-hung cabinetry and other wall-hung items, whether or not such blocking and similar items are indicated on Drawings.
2. See Division 06 Section ROUGH CARPENTRY for installation of blocking and furring within partitions, ie. below gypsum board.
3. Coordinate with Division 09 Section GYPSUM BOARD.

3.3 INSTALLATION

A. General:
1. Comply with AWI, Premium Grade.
2. Install in accordance with final Shop Drawings and manufacturer’s instructions.
3. Install Work plumb, level, true, and straight with no distortions.
a. Shim using concealed shims.
b. Install to tolerance of 1/8 inch in 10 feet (3 mm in 3 m) for plumb and level.
4. Assemble and install Work without machine and tool marks.
5. Neatly fit and scribe Work to adjacent surfaces.

B. Standing and Running Trim:
1. Prime cut edges and ends of exterior standing and running trim, prior to installation.
2. Provide concealed blocking anchored securely to substrate.

3. Install in single lengths without splicing wherever possible, level, plumb and square.
4. Scarf running joints. Stagger joints in adjacent and related members.
5. Cope at returns and internal angles and miter at external angles.
6. Blind nail where possible with fine finishing nails. Set nails for putty stopping.
7. Draw trim tight against finished surfaces.

C. Cabinets:
1. Install with concealed fasteners, plumb and level.
2. Securely attach to supporting substrates and blocking and furring.
3. Coordinate with electrical requirements to provide openings at receptacles and switches.
4. Adjust doors and drawers to center in openings, and to equalize width of gaps between adjoining doors and drawers.

D. Countertops:
1. Install countertops straight, level and plumb.
2. Provide concealed blocking and anchor securely to walls.
3. Coordinate with electrical requirements to provide openings at receptacles and switches.

E. Shelving:
1. Install shelving straight, level and plumb.
2. Securely attach to blocking, using concealed fasteners to greatest extent possible.

F. Touch up shop primer as required after installation.

3.4 ADJUSTING AND REPAIR

A. Before completion of Work, adjust hardware until components operate properly.

B. Replace defective, damaged, missing or stolen hardware.

C. Touch-up marred finishes, including shop primers to match adjacent surfaces.

D. Remove and replace units which are warped, bowed, not properly fitted or finished or otherwise damaged.

3.5 CLEANING AND PROTECTION

A. Clean Work upon completion.

B. Protect units during construction so that they will be without any evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 07 3110

SYNTHETIC SLATE SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Synthetic slate roofing shingles
   2. Self-adhesive underlayment.
   3. Roofing felt underlayment.
   4. Flashing.
   5. Sealants and joint fillers.
   6. Accessories.

B. Single Subcontract Responsibility: Retain a single firm or company, hereinafter referred to as "Slate Roofing Subcontractor" for providing and installing Work of this Section and related Sections so as to establish undivided responsibility for entire slate roofing system.

C. Products Installed but Not Furnished under This Section:
   1. Metal counterflashings and coping.
   2. Sealants and joint fillers in conjunction with above.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's current addition of specifications and installation instructions for each product. Include documentation showing compliance with all physical properties specified for the completed system, as well as individual components.

B. Shop Drawings:
   1. Submit Shop Drawings showing placement of materials in field of roofs.
   2. Show shingle pattern, for each location.
   3. Include details for edge terminations, flashing and typical penetrations.
   4. Reference each material, sequence of placement and penetrations application procedure.

C. Samples:
   1. Shingles:
      a. Submit three sample sets for each type of shingle showing full range of color, texture and finish expected in completed Work.
      b. Sample sets shall consist of minimum three samples in each set.
      c. Samples shall be full size shingles.
   2. Snow guards: Submit full size samples of snow guard.
   3. Metal Valley Flashing: 12 inch square sample.
   4. Each type of accessory involving color selection.

D. Certificate: Submit manufacturer’s certification that roofing slate complies with specified requirements.

E. Qualification Data: Submit Slate Roofing Subcontractor qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

F. Quality Assurance data: Third party inspection & manufacturer site visit reports verifying conformance of installation.

G. Quality Assurance data: Manufacturer's standard warranty.

1.3 SYSTEM REQUIREMENTS

A. Synthetic Shingles - Fire-Resistance Characteristics: Provide synthetic shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
   1. Exterior fire-test exposure:
      a. Class C; ASTM E108 or UL 790, for application and roof slopes indicated.
      b. Comply with International Building Code Type IIIB Construction.

B. Interface With Other Systems:
   1. Coordinate roofing Work with Work of other trades.
   2. Provide materials and accessories in timely manner so as not to delay Work.

1.4 QUALITY ASSURANCE

A. Slate Roofing Subcontractor Qualifications:
   1. Firm or company which has specialized for a period of not less than 5 years in installation of work similar to major components of Work indicated and required for this Project.
   2. Slate Roofing Subcontractor must maintain full-time supervisor on job site during times that roofing Work is in progress. Supervisor must have minimum of five years' experience in roofing work similar in nature and scope to Work of this Project.

1.5 SAMPLE INSTALLATIONS

A. Prior to commencing Work and preceding pre-installation conference, provide sample installation of each type of shingle roofing Work.

B. Extent and Locations: Approximately 100 square feet, in location acceptable to Architect.

C. Materials: Complete installations with complete system materials including underlayment, flashing, shingles, sealants and accessories.

D. Architect's Review:
   1. Architect will review sample installations for visual acceptance of materials and workmanship.
   2. Obtain Architect's approval of sample installations before proceeding with subsequent Work.

E. Maintain approved sample installations during construction as standard for subsequent Work.

F. Properly finished and maintained sample installations may be incorporated into completed Work.

1.6 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Deliver materials in manufacturer's unopened containers or bundles, fully identified with brand, type, grade, class and all other qualifying information.

C. Take necessary precautions to keep products clean, dry and free of damage.

D. Store synthetic slates in locations with temperatures above 45 deg F.

1.8 COORDINATION AND SEQUENCING

A. Sequence and coordinate preparation and installation of new roofing materials with Selective Structural Demolition Work and Work of other trades affected by Work of this Section.

B. Do not proceed with new roofing materials until unsatisfactory conditions have been reported and corrected.

1.9 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Proceed with roofing Work only when existing and forecasted weather conditions will permit Work to be performed in accordance with manufacturer's specifications.
   2. Self-adhesive underlayment:
      a. Apply materials only in fair weather, when ambient, roof deck and underlayment temperatures are 45 deg F or higher.
      b. Do not apply underlayment to moist surfaces.

PART 2 - PRODUCTS

2.1 SYNTHETIC SLATE

A. Acceptable Products and Manufacturers:
   1. Design is based on Empire Slate by EcoStar to establish standard of quality.
   2. Equivalent products by other manufacturers may be acceptable, provided they comply with requirements of Contract Documents.

B. Synthetic Slate Shingles:
   1. Description: Engineered polymer composite material simulating appearance of natural slate.
   2. Physical properties:
      a. Wind resistance: Class F, for 6-inch through 8-inch exposure, when tested in accordance with ASTM D3161.
      b. Impact resistance: Class 4 Classification, when tested in accordance with UL 2218.

3. Color: As selected by Architect from manufacturer's full range.
4. Shapes and Sizes: As indicated on Drawings.

2.2 ASSOCIATED MATERIALS

A. Substrate: One of the following:
1. Minimum 15/32" (12 mm) plywood or 7/16" (11 mm) OSB decking, properly gapped for expansion.
2. Minimum ¾" (19 mm) tongue and groove wood decking with end gaps not exceeding ¼"
3. (6 mm), and board widths not exceeding 6" (152 mm).
4. Metal deck with nail base insulation
5. Minimum slope of substrate: 3/12 (14˚) for 9" (229 mm) exposure installation and a minimum of 6/12 (27˚) for 10" (254 mm) exposure installation.

B. Underlayment:
1. Acceptable underlayment products:
   a. Versashield by GAF.
   b. Granular Surface 100 or Smooth Surface High Temperature 300 Glacier Guard by Eco Star.
   c. Polyolefin coasted with sheet by Aqua Guard.

C. Transition Flashing: Design is based on RoofSeal/OneStep by Eternabond:
1. Rolls: 36 inch wide.
2. Color: White.
3.

D. Fasteners for Shingles: Provide manufacturer's recommended stainless steel ring shank roofing nails.

E. Elastic Cement: Waterproof elastic slaters' cement colored to match slate, product as recommended by slate manufacturer.

F. Snow Guards:
1. Pad style:
   a. Copper, half-round style to match design of existing snow guards; shop-fabricated for use on synthetic slate shingle roofs.
   b. Dimensions: Manufacturer's standard.
   c. Fasteners: Copper; shape and size as recommended by snow guard manufacturer as suitable for condition of substrate and application.
   d. Acceptable product and manufacturer: PD10 Half Round Pad-Style Guard, by Alpine Snow Guards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
1. Do not proceed with new roofing materials until unsatisfactory conditions have been reported and corrected.

3.2 INSTALLATION

A. Install materials in accordance with final Shop Drawings and manufacturer's instructions.

B. Substrate: Install in accordance with final Shop Drawings.

C. Underlayment:
1. Locations: Continuous on plywood sheathing including eaves and rake edges, ridges, valleys, hips, roof penetrations, and other changes in roof plane.
2. Install underlayment on substrate, in accordance with underlayment manufacturer's instructions.
3. Remove dust, dirt, loose nails and other protrusions from sheathing.
4. Work up from low point of roof.
5. Center underlayment sheets at valleys, ridges and hips. Apply membrane in valleys before application at eaves.
6. Apply succeeding sheets with minimum 3-1/2 inch side laps and 6 inch end laps.
7. Do not leave underlayment exposed for more than 48 hours, before covering with shingles.

D. Flashing:
1. Unless otherwise indicated, comply with the following:
   a. Line valleys with 4 inch lap joints; turn edges and fasten with cleats.
   b. At sides of vertical surfaces, extend flashing at least 6 inches up vertical surface and extend and lap flashing under shingles minimum 4 inches.
   c. Terminations at vertical surfaces: Provide step flashing built into masonry Work.
   d. Provide flashing at hips and gutters as indicated and as recommended by shingle manufacturer.
2. Sequence flashing installation with slating.

E. Slating:
1. General: Install according to manufacturer’s instructions.
   a. Provide preformed starter course shingles at eaves.
   b. Use integral spacer tabs in side edges of shingles to ensure proper 1/4 inch spacing between shingles. Clip tabs only from exposed edges; do not clip tabs between adjacent shingles.
2. Do not install slates which are broken, cracked, chipped, dirty, stained or otherwise damaged. Replace damaged slates as required with sound materials.
3. Install slate with projection at eaves and projection at gable ends of same dimensions as for existing slate shingles.
4. Lay slates in horizontal courses with head lap of same dimension as for existing slate shingles.
5. Offset joints in each course minimum 3 inches from preceding course, to match offset of existing slate shingles.
6. Build in and place flashing as slating Work proceeds.
7. Neatly fit slate around pipes, ventilators, or other vertical obstructions.
8. Eaves or cornice lines:
   a. Install 1/4 inch thick wood cant strip along edge.
   b. Double slates using same thickness slate for under-eaves at first exposed course.
   c. Under-eave slate shall be approximately 3 inches longer than exposure of first course.
9. Ridges: Lay pre-fabricated ridge units.
10. Valleys: Lay slates to form valley configuration matching that of existing slate shingles.

11. Fastening:
    a. Drive nails in manner to avoid producing strain on slate.
    b. Conceal nails, except where unavoidable at top courses.
    c. Where slates overlap sheet metal, place nails to avoid puncturing metal.
    d. Synthetic slates:
        1) Fasten by hand-nailing, or using pneumatic nail gun set to 100 psi. Do not allow end of nail gun to punch slates.
        2) Lay hip slates and ridge slates according to shingle manufacturer's instructions.

F. Snow Guards:
1. General:
    a. Locate each style of snow guard in locations indicated on Drawings.
    b. Install snow guards in accordance with snow guard manufacturer's instructions.
2. Pad style:
    a. Install in locations indicated on Drawings.
    b. Install snow guards as shingles are being installed. Fasten using copper nails through punched holes in strap, into sheathing.
    c. Install in accordance with layout indicated on Drawings from a line no closer than 2 feet from eaves edge of roof; uniformly space snow guards in 3-row pattern approximately 24 inches on center centered on shingle joints, and every second course vertically, staggered in a uniform pattern from course to course.

3.3 CLEANING AND PROTECTION

A. Clean shingles in accordance with manufacturer's recommendations.

B. Upon completion, shingles must be sound, whole, clean and roof shall be left watertight and neat in every respect.

C. Protect Work during construction so that it will be without evidence of damage at time of acceptance.

3.4 QUALITY CONTROL

A. Schedule and conduct 3rd party inspections regularly at preparatory, initial and follow up stages to ensure conformance of installation with contract documents.

B. Schedule manufacturer site visit at completion of installation for final acceptance and issuance of warranty.

END OF SECTION

SECTION 07 5400

MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Sections includes, but is not limited to, the following:
   1. Adhered thermoplastic membrane roofing system.
   2. Vapor retarder.
   3. Roof insulation.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 06 1000 ROUGH CARPENTRY for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.

B. See Section 07 6200 SHEET METAL FLASHING AND TRIM for metal roof flashings and counterflashings.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Provide project-specific Shop Drawings, drawn to scale, for roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
   4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:
   1. Sheet roofing, of color required.
   2. Walkway pads or rolls, of color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Warranty.

1.7 PERFORMANCE REQUIREMENTS

A. Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist roof uplift pressures as indicated on Structural Drawings and in accordance with ASCE/SEI 7.

D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.8 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

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

1.12 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of roofing system.
   2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain components including roof insulation, fasteners, adhesives, flashings, and transition membranes for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 THERMOPLASTIC MEMBRANE ROOFING

2.3 [SELECT ONE TYPE FROM BELOW]

A. Roof Membrane:
   1. PVC Ethylene-Interpolymer Alloy Sheet: ASTM D 4434/D 4434M, Type III, with felt or fabric backing.
   2. Thickness: 80 mils (1.5 mm), nominal.
   3. Exposed Face Color: White with acrylic coating.
   4. Acceptable Manufacturers:
      a. Johns Manville.
      b. FiberTite.
      c. Carlisle Syntec Systems.
      d. Sarnafil.

B. Roof Membrane:
   1. KEE (ethylene interpolymer), fabric reinforced, 0.045 inch (1.5 mm) thick, complying with ASTM D 6754.
   2. Exposed face color: To be selected by Architect from manufacturer's full range.
   3. Acceptable product and manufacturer: Equivalent to 45 mil FiberTite-SM by FiberTite Roofing System.

2.4 AUXILIARY ROOFING MATERIALS

A. Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch (16 mm) thick.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.6 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
   1. Adhesive: Manufacturer's standard lap adhesive, FM Global approved for vapor-retarder application.

B. Laminated Sheet: Polyethylene laminate, two layers, reinforced with cord grid, with maximum permeance rating of 0.06 perm (3.5 ng/Pa x s x sq. m).
   1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.7 ROOF INSULATION

A. Preformed roof insulation boards manufactured or approved by sheet membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES

A. Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

D. Cover Board: ASTM C 208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch (13 mm) thick.

2.9 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
   1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.5 VAPOR-RETARDER INSTALLATION **[INCLUDE IF PART OF ROOF ASSEMBLY]**

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively. Continuously seal side and end laps with manufacturer's recommended tape or adhesive.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Insulation Installation on Steel Deck:
   1. Mechanically fasten each layer of insulation to steel deck.
   2. Use 1 insulation fastener and plate per 2 square feet (.186 meters square) of insulation, unless otherwise recommended by insulation and membrane manufacturers.
   3. Installation of non-tapered insulation:

a. Install insulation at right angles to deck ribs. Stagger end joints.
b. Offset joints in second layer from joints in first layer by at least 12 inches (300 mm) in each direction.

4. Installation of tapered insulation and crickets: Install as indicated on final Shop Drawings, in proper sequence to achieve required slopes and configurations.
5. Cut and neatly fit insulation at edges and penetrations. Leave 1/4 inch (6 mm) gap between insulation and vertical surfaces.
6. Do not install more insulation than can be covered by roof membrane in one day.

H. Insulation Installation on Concrete Deck:
1. Install as indicated on final Shop Drawings, in proper sequence to achieve required slopes and configurations.
2. Lay insulation directly on concrete deck. Cut and fit neatly with joints tightly butted and staggered.
a. Leave a 1/4 inch (6 mm) gap between insulation and vertical surfaces.
b. If ambient temperature is 40 deg F (4 deg C) or below during installation, do not butt joints tightly.
3. Fastening:
a. For adhered system, use Alternate Insulation Attachment Method which specifies a flood coating of hot asphalt with a series of grid nailers. Insure that equivalent products do not require penetration of substrate for fastening of insulation or recovery board.

I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.

3.7 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.
1. Install sheet according to ASTM D 5036.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing. Follow manufacturer recommendations to ensure proper adherence of membrane & flashing to underlying substrates at corners, and edges. Also, at changes in vertical-horizontal plane along parapet, perimeter, interior walls, steps and curbs supporting mechanical equipment.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.8 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches (75 mm) of space between adjacent roof pavers.

3.10 FIELD QUALITY CONTROL

A. 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. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover each entire test area.
   2. Testing agency shall provide survey report indicating locations of discontinuities and leaks, if any. Include CAD drawings, photographic documentation, and a written report

B. Embedded Leak Detection System:
   1. Coordinate installation of leak detection system with membrane roofing manufacturer.

2. Measurement Grid: Install measurement on membrane substrate immediately under membrane and immediately prior to installation of membrane.
   a. Verify that location of measurement grid fasteners does not interfere with or cause damage to membrane.
   b. Fasten measurement grid in accordance with leak detection system manufacturer's requirements.
   c. Do not place measurement grid where it will be in continuous direct contact with structural components.
   d. Provide minimum 2 inch overlap where adjacent sheets meet, including side laps and end laps.
   e. Cut measurement grid as close as possible to the perpendicular strand at both end and side edges
3. Conductor Wire: Install conductor wire on top of membrane at spacing and layout indicated on approved shop drawings.
   a. Secure conductor wire using method recommended by manufacturer.
4. Installation Testing: Verify continuity and functioning of conductor wire and measurement grid upon completion of installation for fluid-applied protection membrane roofing and prior to installation of overburden.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. This section is for INTERIOR USE ONLY
   2. Interior steel doors.
   3. Interior steel frames (Exterior Hollow Metal Frames are not allowed).
   4. Steel frames for interior glazing.
   5. Interior door louvers.
   6. Interior, glazed door (vision) panels.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 08 7100 DOOR HARDWARE for hardware requirements.

B. See Section 08 8000 GLAZING for glass requirements.

C. See Section 09 9000 PAINTING AND COATING for field applied finish.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each component and finish.

B. Shop Drawings - Door Schedule:
   1. Submit Shop Drawings for fabrication and installation of steel doors and frames.
   2. Include locations, configuration, details, elevations, conditions at openings, and fire rating for each door type.
   3. Include hardware locations (including security hardware), mounting details and anchorage.
   4. Details of conduit and preparations for power, signal & control systems.

1.4 SYSTEM REQUIREMENTS

A. Fire Resistance Requirements:
   1. Comply with label requirements of NFPA and applicable local codes.
   2. Fabricate door and frame assemblies that comply with NFPA 80, are identical to door and frame assemblies tested per NFPA 252 and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Fabricate borrowed light frame assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having

jurisdiction, for fire protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

4. Provide UL labels permanently fastened at factory on each door and frame within size limitations established by NFPA and UL for labeling.
5. Provide anchors for UL labeled frames required by authority having jurisdiction.
6. Provide labeled egress doors at stairs with maximum transmitted temperature end point of not more than 450 deg F (140 deg C) above ambient at the end of 30 minutes of standard fire test exposure.
7. For units exceeding sizes of tested assemblies, provide certification by testing agency acceptable to authorities having jurisdiction that doors conform to standard construction requirements of tested and labeled fire-rated door assemblies except for size.

B. Interface With Other Systems:
1. Coordinate with Work of other trades affected by Work of this Section.
2. Provide items, such as anchors or supports, in a timely manner so as not to delay job progress.
3. Place items, such as anchors or supports, accurately in relation to final locations.
4. Use Contractor's bench marks.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

B. Manufacturer Qualifications:
1. Company specializing in steel doors and frames for fire rated openings, having minimum of 5 years successful, documented experience with work comparable to that required for this Project; member of Steel Door Institute.
2. Company whose units are inspected, tested and listed by UL for single point hardware and astragal conditions for sizes and profiles indicated.

C. Reference Standards: Comply with applicable provisions of Steel Door Institute.

1.6 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work. Discuss at minimum the following:
1. Schedule for completion.
2. Submittals status.
3. Field verification of dimensions.
4. Coordination for efficient electronic/security hardware integration.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect units from damage during transit, storage and installation.

B. Tool marks, rust, blemishes and any other damage on exposed surfaces will not be acceptable.

C. Store units in dry location, off ground and in such manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot-Rolled Sheet Steel: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Sheet Steel: ASTM A1008, Commercial Steel (CS).

C. Metallic-Coated Steel Sheets: ASTM A653, Commercial Steel (CS), Type B, with A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

D. Prime Paint:
   1. Rust-inhibitive enamel or paint, compatible with finish paints as specified in Section 09 9000 PAINTING AND COATING.
   2. For metallic-coated steel: High zinc-dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with SSPC Paint 20.

2.2 ACCESSORIES

A. Supports and Anchors: Fabricate from metallic-coated sheet steel, of thicknesses as follows.
   1. Frames for interior doors:
      a. Doors to Shower Rooms: 0.064 inch thick.
      b. Other interior doors: 0.052 inch thick.

B. Inserts, Bolts and Fasteners: Manufacturer's standard units.

C. Jamb Anchors:
   1. Masonry and concrete substrates:
      a. Tee shaped corrugated or perforated metal anchors built into adjoining construction.
      b. Fabricate anchors from steel, same thickness as frame; 2-1/2 inches wide x 10 inches long (63 mm wide x 250 mm long).
      c. Use adjustable anchors with friction fit for frames set in masonry; weld to frames set in concrete.
      d. Provide 3 per jamb up to 7'-0” (2100 mm) high and 4 per jamb over 7'-0” (2100 mm) high.
      e. Where concrete has been placed prior to setting of frames, anchor with 3/8 inch (9 mm) countersunk flat head bolts with expansion shields or inserts; minimum 4 per jamb. Dimple and reinforce frame face to set bolt heads slightly below face.
   2. Steel stud substrates:
      a. Fabricate anchor clips from 0.0598 inch (1.5 mm) thick steel; width to match stud width.
      b. Jamb anchors: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         1) Three anchors per jamb up to 60 inches in height.
         2) Four anchors per jamb from 60 up to 90 inches in height.
         3) Five anchors per jamb from 90 up to 96 inches in height.

4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.

c. Head anchors:

1) No anchors required for frame less than 42 inches wide.
2) Two anchors for frames more than 42 inches wide but less than 48 inches wide.
3) Reinforced frames for frames wider than 48 inches.

3. At fire rated frames, comply with fire resistance requirements and provide UL rated anchors.

D. Floor Anchors: Where floor fill or setting beds occur, provide 0.1046 inch (2.657 mm) thick adjustable clip angles, with pre-drilled holes, welded to frame for attachment to structural substrate.

E. Vertical Bracing:

1. For frames supported on steel studs, if studs at jamb do not extend to structure above, provide vertical steel struts, 3/8 inch x 2 inches (9 mm x 50 mm), extended from top of frame at each jamb to supporting construction above.
2. Bend top of struts at right angle and attach to supporting construction by bolting, welding or other suitable anchorage.

F. Bituminous Coating for Doors at Swimming Pool Areas:

1. Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil (0.4 mm) dry film thickness per coat.
2. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 FABRICATION

A. Fabrication Requirements:

1. Fabricate units rigid, neat, free from defects, warp or buckle. Shop fabricate units in largest units practicable.
2. Reinforce units as required to prevent twisting or sagging.
3. Form exposed surfaces with corners square, unless otherwise indicated. Form molded members straight and true, with joints coped or mitered. Dress welded joints smooth so they are invisible after finishing.
4. Conceal fastenings, unless otherwise indicated. Countersink exposed screws using flat, Phillips head screws.

B. Steel Doors:

1. Provide metal doors of types and styles indicated. Comply with ANSI A250.8 for materials and construction requirements.
2. Fabricate exposed faces of doors and panels from cold-rolled steel sheets.
3. Interior doors: Provide Level 3, Model 2 doors with 0.053 inch (1.3 mm) thick face sheets, metallic-coated.
4. Doors at Serveries or Kitchens: Fabricate door with solid metal sheet across the bottom of the door to prevent rodents from chewing door bottom.

C. Steel Frames:

1. Provide metal frames of types and styles indicated. Comply with ANSI A250.8 for materials and construction requirements, except brake-form custom shapes as required to provide profiles and configurations indicated.
2. For openings over 4'-0" (1200 mm) wide, increase thickness by at least 0.014 inch (0.4 mm).
3. Provide heavier thicknesses as required for configuration indicated or as required to comply with regulatory or fire rating requirements.
4. Welded frames:
   a. Fully welded construction, including jamb and head stops, with welded, mitered and reinforced corner joints.
   b. Welds on exposed faces shall be ground smooth and flush to provide smooth, seamless faces and edges.
   c. Provide 0.0598 inch (1.5 mm) thick steel channel spreaders at bottom of frames to prevent distortion during shipment and installation.
5. Mullions and transom bars: Closed or tubular construction to match indicated profiles.

D. Hardware:
1. Prepare doors and frames to receive hardware. Coordinate with Hardware Schedule. Comply with SDI 107 and ANSI A115 "Specifications for Door and Frame Preparation".
2. Mortise, reinforce, drill and tap units at factory to receive mortise type hardware.
3. Reinforce, drill and tap units to receive surface applied hardware.
4. Use minimum thickness reinforcement for hardware recommended by SDI.
5. Locate hardware as indicated on final Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
6. Provide metal plaster guards for mortise cut-outs.
7. Prepare doors and frames to receive mortise and surface mounted security hardware.

E. Louvers: Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020 inch (0.5 mm) thick, cold-rolled steel sheet set into 0.032 inch (0.8 mm) thick steel frame.
1. Sightproof louvers: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Lightproof louvers: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
3. Fire-rated automatic louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

F. Glazed Frames:
1. Form glazed light frames profiles shown. Provide anchors at jambs same as for door frames. Provide closed mullion sections fabricated from minimum 0.0598 inch (1.5 mm) thick steel.
2. Miter, fit and weld corners of frames. Secure removable moldings with not less than No.6 x 32 Phillips ovalhead countersunk machine screws at 12 inches (300 mm) on center.
3. Provide continuous felt strips cemented in place, on bed and stop surfaces, so that glass does not touch metal.

G. Glazed Door (Vision) Panels:
   1. Provide glazed panels; sizes and glass types as indicated. On Drawings.
   2. Provide glazing frame assembly with fixed and removable moldings flush with face sheets.
   3. Glaze with manufacturer's standard glazing materials, consistent with fire ratings.

H. Glazing Stops:
   1. Minimum 0.0359 inch (0.9 mm) thick steel.
   2. Provide non-removable stops on secure side of interior doors.

2.4 SHOP FINISH

A. Prime Finish:
   1. Clean, pretreat, and apply manufacturer's standard primer
   2. Shop primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
   3. Provide minimum 2 coats of primer to reinforcement and attachment steel in contact with concrete or masonry.
   4. Apply primer with even consistency with a uniformly finished surface.

B. Metallic-Coated Steel Sheet Finishes:
   1. Clean surfaces to remove contaminants and apply conversion coating of type suited to organic coating applied.
   2. Clean welds, mechanical connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with final Shop Drawings and manufacturer's instructions.

B. Frame Installation:
   1. Comply with provisions of ANSI A250.11. Heed installation tolerances for squareness, alignment, twist & plumbness, as specified therein.
   2. Set frames accurately in position, plumbed, aligned and braced securely.
   3. Coordinate installation of built-in anchors for wall partition construction.
   4. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
   5. Terminate frames at indicated finished floor level. Where floor fill or setting beds occur, support frames with adjustable clip angles, anchored to structural substrate.

6. Anchor frames to concrete and existing masonry construction with bolts, spacers and masonry anchorage devices; fill depressions in frames with body putty and grind smooth.
7. After wall construction is complete, remove temporary braces and spreaders.
8. Leave surfaces smooth and undamaged.

C. Door Installation: Fit doors accurately in frames within clearances specified in ANSI A250.8, unless otherwise shown.

D. Install labeled fire doors and frames to meet requirements of cited references and NFPA Standard No. 80.

E. Install hardware in accordance with hardware manufacturer's instructions and as specified in Section 08 7100 DOOR HARDWARE. Adjust installation to provide uniform clearance at head and jambs and to contact stops uniformly.

3.3 ADJUSTING, REPAIR AND CLEANING

A. Adjusting:
1. Before completion of Work, adjust hardware until doors operate properly.
2. Adjust doors to provide uniform clearance at head and jambs and to contact stops uniformly.
3. Test security devices with operation of security system in Owner's presence.

B. Repair:
1. Remove and replace doors which are warped, bowed, not properly fitted to frames or otherwise damaged; and doors which do not swing or operate freely.
2. Sand smooth rusted or damaged areas of prime coat and touch-up with compatible air-drying primer.
3. Replace defective, damaged, missing or stolen hardware.
4. Repair damaged metallic coating in accordance with ASTM A780.

C. Cleaning: Clean doors and frames.

3.4 PROTECTION

A. Protect units during construction so that they will be without any evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 08 2130

FRP AND ALUMINUM ENTRANCE DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Fiberglass reinforced polyester (FRP) flush doors with hollow metal or aluminum frames.
2. Glass and glazing.
3. Sealants, joint fillers and gaskets.
4. Flashing, weeps and vents.
5. Perimeter and integral anchors, reinforcing, inserts, bearings, expansion devices and fasteners.
6. Finishing.
7. System design and engineering.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 08 Section DOOR HARDWARE for entrance door hardware.

B. See Division 08 Section GLAZING.

1.3 ACTION SUBMITTALS

A. Combined Submittal:
1. Submit items required in this Section as a combined submittal with requirements of Section 08 8000 GLAZING.
2. Assemble submittals, including Product Data, Shop Drawings and Samples, of principal component parts into this submittal and prepare coordination details and erection diagrams for complete system.
3. Show in this submittal that entrance door assemblies have received prior approval of Contractor, installer, and manufacturer or fabricator of each principal component including metal, glass, sealants and gasketing components.

B. Product Data: Submit manufacturer's specifications and installation instructions for each component and finish.

C. Shop Drawings:
1. Submit Shop Drawings for interior and exterior entrance doors.
   a. Show plans, elevations and typical details of each condition for every member, joint, anchorage and door system.
   b. Show isometric joining and sealant details of all member intersection and corner conditions.
   c. Include hardware details, locations and mounting heights.

D. Samples:
   1. Entrance door components:
      a. Submit three sample sets for each type of finish showing full range (high, middle and low) of color, texture and finish expected in completed Work.
      b. Prepare samples on specified alloy, temper and thickness of metal required for Work.
      c. Sample sets: Minimum three samples in each set.
      d. Samples size: Minimum 12 inch (300 mm) long for extrusions and 12 inch square (300 mm square) for sheet or plate.
   2. Samples for sealant adhesion and compatibility testing:
      a. Submit to sealant manufacturer for pre-construction testing.
      b. Size and quantity: As required by sealant manufacturer.

1.4 INFORMATIONAL SUBMITTALS

A. Initial Submittal Requirements:
   1. Qualification data: Submit installer and manufacturer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.
   2. List of suppliers: Submit complete listing of products, fabricators and sub-sub-contractors involved in entrance door Work.

B. Calculations:
   1. Submit, for information only, engineering calculations verifying that maximum deflections and stresses do not exceed specified performance requirements under full design loading.

C. Design Modifications: Submit for review any proposed variations in details or substitutions in materials required to meet specified performance requirements and to coordinate Work.

D. Test Reports:
   1. Submit certified test reports performed by recognized testing laboratory verifying that systems submitted for use on this Project have been previously tested and meet or exceed specified performance requirements.
   2. Submit certified data verifying adhesion qualities of proposed aluminum finishes and sealants through adhesion and peel testing.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit instructions which describe materials, devices and procedures to be followed in cleaning and maintaining systems.
   2. Include manufacturer's brochures describing the actual materials used in Work, including metal alloys, finishes, glass, sealants, gaskets and other major components.
   3. Include copy of submittal in Project information manual.

B. Warranties: Submit signed and dated warranties.

1.6 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Drawings indicate design concept, size, shape and location of various components. Conform to design, specified performance requirements and material selections.
2. Design modifications:
3. May be proposed by manufacturer to satisfy performance requirements.
4. Conform to design and specified durability and strength.
5. Maintain profiles and alignments shown.
6. Size glazing channels to provide adequate bite on glass, minimum edge clearances and adequate width for sealants, as recommended by manufacturers of entrance door systems, glass, and sealants.

B. Structural Performance Requirements:
1. Comply with specified criteria, unless more stringent criteria is required by local authorities having jurisdiction.
2. Design loads: As indicated on Structural Drawings.
3. Glass Statistical Factor (Safety Factor): Refer to Division 08 Section GLAZING.
4. Thermal movement:
   a. Design, fabricate and install components to withstand thermal expansion and contraction forces resulting from an ambient temperature range of minus 5 deg F (minus 21 deg C) to plus 110 deg F (43 deg C) and surface temperature range of 5 deg F (minus 15 deg C) to 185 deg F (85 deg C) without causing buckling, undue stress on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.
5. Design factor of safety:
   a. Design and fabricate structural components including members, glazing stops or gaskets, weldments, connection adhesives and sealants used as adhesives with factor of safety not less than 1.5 (i.e., failure of any structural component shall not occur at less than 1.5 times maximum “Design Wind Pressure” in accordance with ASTM E330).
   b. Failure is defined as breakage, disengagement or permanent distortion.

C. Air Leakage and Water Penetration Performance Requirements:
1. Design, fabricate and install systems, including joints between systems and other Work, to effectively prevent leakage of either water or air into building, both under specified test conditions and under any combination of specified performance requirements.
2. Water penetration:
   a. Definition: Appearance of uncontrolled water, other than condensation, on indoor face of any part of wall, including in concealed spaces adjacent to or below the entrance door system.
   b. Design system of gutters and weeps to drain water to exterior face of wall.
   c. Design system so no uncontrolled water penetration occurs when wall is tested in accordance with ASTM E331 with air pressure differential of 20 percent of inward design wind pressure, but not less than 3.75 psf.
3. Air leakage:
   a. Design system so that air infiltration does not exceed the following allowable infiltration rates when tested in accordance with ASTM E283 at static air pressure differential of 6.24 psf. (300 Pa).

b. Fixed units: .01 cfm per square foot (.05L/s per sq.m).

D. Thermal-Break or Thermally-Improved System Requirements:
1. Provide system tested to demonstrate resistance to thermal conductance and condensation, and tested to show adequate strength and security of glass retention.
2. Provide aluminum components with integrally concealed low conductance thermal barrier, located between exterior materials and window members exposed on interior, eliminating direct metal-to-metal contact.
3. If poured polyurethane thermal break systems are used, fabricate with mechanical interlock to prevent shrink back.

E. Sealant Compatibility Requirements: Verify adhesion qualities of intended finishes and coatings with sealants through adhesion and peel testing in conjunction with sealant manufacturer.

F. Visual Requirements:
1. Metal surfaces: Fabricate surfaces exposed to view from materials which are smooth and free of surface blemishes. Do not use materials which have stains and discolorations, including welds, exposed in completed Work.
2. Surface flatness and edges: Provide flat surfaces with machine cut edges and corners sharp and true to angle or curvature required.

1.7 QUALITY ASSURANCE

A. Installer/Manufacturer Qualifications:
1. Firm or company which has specialized for a period of not less than 5 consecutive years in successful design, fabrication and installation of work similar to major components of Work indicated and required for this Project.
2. Employ only experienced tradesmen with minimum 5 years successful experience in fabrication and installation of work.
3. System design and engineering: Performed under direct supervision of a Registered Professional Engineer, licensed in Project jurisdiction.

1.8 SAMPLE INSTALLATION

A. Prior to commencing Work and preceding pre-installation conference, provide sample installation of Work.

B. Size and Location: As indicated on Drawings.

C. Materials: Incorporate complete materials as required for finished Work.

D. Architect's Review:
1. Architect will review sample installation for visual acceptance of workmanship.
2. Obtain Architect's approval of sample installations before proceeding with subsequent Work.

E. Maintain accepted sample installation during construction as standard for subsequent Work.

F. Properly finished and maintained sample installation may be incorporated into completed Work.

G. Dismantle unacceptable sample installation and remove from site.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver fabricated units and component parts to site identified in accordance with erection diagrams prepared by manufacturer.

B. Store in accordance with manufacturer's instructions, above grade on dunnage, properly protected from weather and construction activities.

1.11 PROJECT CONDITIONS

A. Verify dimensions of supporting structure at site by accurate field measurements so that Work will be accurately designed, fabricated and fitted to structure. Tolerances for supporting structure are specified in other Sections.

B. Fabrication and erection procedures shall take into account ambient temperature range at time of respective operations.

1.12 SEQUENCING AND SCHEDULING

A. Coordinate entrance door Work with contiguous Work and provide components at proper time and sequence to avoid delays in overall Work.

1.13 WARRANTY

A. Provide 5 year written warranty signed by Contractor, installer and manufacturers agreeing to repair or replace defective materials or workmanship, including any evidence of early deterioration, weathering or aging of Work, uncontrolled water penetration or air infiltration, glass breakage, deterioration of finishes, failure of operating parts to properly function and any other deterioration or failure of Work to conform to Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
   1. Design is based on doors listed below as manufactured by Special-Lite to establish a standard of quality.
   2. Equivalent systems by other manufacturers may be acceptable provided they can meet performance and finish requirements and design profile limitations, including certified

test reports showing compliance with referenced United States standards at time of submittal.

2.2 MATERIALS

A. Aluminum Sheets and Plates:
1. Sizes and minimum gages as indicated and as required to fulfill performance requirements.
2. Suitable alloy for forming and fabrication requirements with adequate temper and structural characteristics and suitable for finishing as specified.

B. Carbon Steel: High strength, low alloy products or structural steel as required to fulfill performance requirements.

C. Glass and Glazing:
1. Spacers, setting blocks, gaskets, and bond breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and system performance requirements.
2. Glazing sealants and glass: See Division 08 Section GLAZING.

2.3 COMPONENTS

A. Exterior Doors – Aluminum and FRP:
1. Construction:
a. Door Thickness: 1-3/4 inches.
b. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
c. Corners: Mitered.
d. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
e. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
f. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
g. Rail caps or other face sheet capture methods are not acceptable.
h. Extrude top and bottom rail legs for interlocking continuous weather bar.
i. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
j. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
2. Face Sheet: Exterior grade UV resistant FRP, 0.120-inch thickness, finish color throughout.
3. Core: Poured-in-place polyurethane foam.
4. Cutouts: Manufacture doors with cutouts for required vision lites, louvers, and panels.
5. Door glazing system: Manufacturer's standard system as required to fulfill performance requirements.

6. Finish hardware: Provide doors complete with operable hardware, and with door manufacturer's standard head, jamb, astragal, and sill weatherstripping.
7. Acceptable product and manufacturer: Equivalent to SL-20 FRP/Aluminum Hybrid Door by Special-Lite.

B. Doors at Swimming Pools:
1. Construction:
   a. Door Thickness: 1-3/4 inches.
   b. Construction: FRP, pultruded as one monolithic panel, with integral stiles.
   c. Reinforcement: Solid FRP shapes chemically welded at factory. All structural members shall utilize a chemically resistant UV stabilized resin system.
   d. Stile Edge: Seamless 9/16 inch thick solid FRP.
   e. Top Rail: 6 inch pultruded tube profile designed to fit flush and be chemically welded inside the door.
   f. Bottom Rail: Pultruded FRP inverted U channel designed to fit flush and be chemically welded inside the door, allowing doors to be field trimmed. Closed bottom rail to be supplied as an option.
2. Face Sheet: Pultruded FRP, 0.125-inch thickness.
3. Core: Polyurethane foam.
4. Cutouts: Manufacture doors with cutouts for required vision lites, louvers, and panels.
5. Hardware: Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
6. Acceptable product and manufacturer: Equivalent to AF Pultruded Door AF-100 by Special-Lite.

C. Finish: Manufacturer’s standard high-gloss two-part aliphatic polyurethane coating.

D. Miscellaneous Trim and Closures:
1. Form from brake formed or extruded aluminum, minimum 0.06 inch (1.5 mm) thick, to profiles and dimensions shown.
2. Form bends smooth and true.
3. Provide flush meeting edges without metal-to-metal laps at joints.

2.4 ACCESSORIES

A. Firestopping: See Division 07 Section FIRESTOPPING.

B. Perimeter Sealants and Joint Fillers: See Division 07 Section JOINT SEALANTS.

C. Fasteners:
1. Provide fasteners for attachment of components to structural supports and for connecting components as recommended by component manufacturers and selected to prevent galvanic action with components fastened.
2. For embedment in masonry or concrete, provide zinc plated fasteners, conforming to requirements of ASTM B633 for Class FE/ZN 8, service condition SC2 (moderate) with Type II finish meeting corrosion resistance requirements after 96 hour salt spray test, unless otherwise selected by manufacturer.
3. For attachment of aluminum components, provide AISI 300 series stainless steel.

4. Provide concealed fasteners, except where indicated or where shown and accepted on final Shop Drawings. Where exposed in finished surfaces, use oval-head countersunk Phillips heads with color to match adjacent surfaces.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.

E. Reinforcing and Joining Materials:
1. Steel angles, plates, bars, rods and other steel accessories: Hot-dipped galvanized, or if galvanizing is not compatible with alloy of component parts, shop painted with manufacturer's standard standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   a. Structural shapes, plates, and bars: ASTM A36.
   b. Cold-rolled sheet and strip: ASTM A1008.
   c. Hot-rolled sheet and strip: ASTM A1011.
2. Aluminum angles, plates, bars and other aluminum accessories: Alloys as recommended by manufacturer or fabricator to develop required strength of assembly.

F. Inserts: Galvanized steel or cast iron inserts of suitable design and adequate strength for condition of use.

G. Concealed Flashing: Dead soft stainless steel 26 gage minimum.

H. Slip and Separator Gaskets: Types and materials as recommended by manufacturer for joint condition.

I. Galvanizing Repair Paint: High zinc-dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with SSPC Paint 20.

2.5 FABRICATION

A. Fabricate in accordance with final Shop Drawings and component manufacturer's instructions.

B. Fit and assemble Work in shop insofar as practicable. Mark and disassemble units which are too large for shipment to Project site, retaining units in sizes as large as possible for shipment and erection.

C. Complete welding, cutting, drilling and fitting of joints prior to chemical treatment and application of finishes.

D. Welding:
1. Weld with electrodes and by methods recommended by aluminum manufacturer and in accordance with applicable recommendations of AWS.
2. Use only methods which will avoid distortion or discoloration of exposed faces.
3. Grind weld areas smooth and restore finish before proceeding with other treatment.

E. Reinforce members and joints with steel plates, bars, rods or angles as required for rigidity and strength and as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.

F. Separate dissimilar metals or alloys with heavy coating of bituminous coating or other suitable permanent separation as required to prevent galvanic action.

G. Conceal fasteners unless otherwise indicated or otherwise shown and accepted on final Shop Drawings.

H. Carefully fit and match Work with continuity of line and design, using rigidly secured joints with hairline contact unless otherwise shown.

I. Entrance Doors:
   1. Check door frame dimensions before proceeding with fabrication of doors.
   2. Fabricate stile and rail doors with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or J-bolts. In addition, weld corners at concealed points of contact of stiles and rail webs.
   3. Provide rabbets and removable stops required for glazing. Miter or kerf stops to provide hairline joints at corners of glass and panels.

2.6 SHOP FINISHES

A. FRP Doors and Frames: Manufacturer’s standard high-gloss two-part aliphatic polyurethane coating.

B. Aluminum Doors: 3-coat fluoropolymer finish, custom color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with final Shop Drawings and manufacturer's instructions and recommendations for installation of Work.
   1. Do not install damaged components.
   2. Fit joints to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   5. Seal joints watertight unless otherwise indicated.
   6.
   7.

B. Erection Tolerances:
   1. Variations from plumb or any dimensioned angle shown: +/- 1/8 inch (+/- 3 mm) maximum in any story height or 10 foot (3 m) run, non-cumulative.
   2. Variations from level: +/- 1/8 inch (+/- 3 mm) maximum in any column-to-column space or 20 foot (6 m) run, non-cumulative.
   3. Variations from theoretical calculated position as located in plan or elevation in relation to established floor lines, column line and other fixed elements of the structure, including variations from plumb, level, straight and member size: 1/4 inch (6 mm) maximum variation in any column-to-column space or floor-to-floor height, or 20 feet (6 m).
   4. Offsets in end-to-end or edge-to-edge alignment of consecutive members: 1/16 inch (1.5 mm).

C. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

E. Doors:
   1. Securely anchor in place to straight, plumb and level conditions, without distortion.
   2. Check hardware movement and weatherstripping contact, making final adjustments as necessary.

F. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section JOINT SEALANTS to produce weathertight installation.

G. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

H. Install glazing as specified in Division 08 Section GLAZING.

I. Repair damaged galvanized coating in accordance with ASTM A780.

J. Apply sealants in accordance with requirements of Division 07 Section JOINT SEALANTS.

3.3 PROTECTION AND CLEANING

A. In addition to specific protection and cleaning methods required for each component part and recommended by respective manufacturers, maintain entrance doors throughout construction period in clean and properly protected condition so that it will be without any indication of use or damage at time of acceptance.

B.

C.

D. Carefully select and apply cleaning and maintenance methods so that finishes will not become uneven or otherwise impaired as result of unequal exposure to light and weathering conditions.

E. ND OF SECTION

SECTION 08 4113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Aluminum framing for glass, panels, doors and other components.
   2. Aluminum framed storefront and openings.
   3. Aluminum sheet metal Work including aluminum trim and miscellaneous closures.
   4. Glass and glazing.
   5. Sealants, joint fillers and gaskets.
   6. Flashing, weeps and vents.
   7. Perimeter and integral anchors, reinforcing, inserts, bearings, expansion devices and fasteners.
   8. Finishing.
   9. System design and engineering.

B. Single Subcontract Responsibility: Retain a single firm or company to design, fabricate and install Work of this Section and related Sections so as to establish undivided responsibility for entire window wall system.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 05 5000 METAL FABRICATIONS for window security screens.

B. See Section 08 4114 FRP AND ALUMINUM FRAMED ENTRANCE DOORS for entrance doors to be incorporated into storefront.

C. See Section 08 7100 DOOR HARDWARE for entrance door hardware.

D. See Section 08 8000 GLAZING.

E. See DIVISION 26 for wiring requirements for electrically operated hardware devices and electrical provisions for security system.

1.3 ACTION SUBMITTALS

A. Combined Submittal:
   1. Submit items required in this Section as a combined submittal with requirements of Section 07 9200 JOINT SEALANTS, Section 082130 FRP AND ALUMINUM ENTRANCES and Section 08 8000 GLAZING.
   2. Assemble submittals, including Product Data, Shop Drawings and Samples, of principal component parts into this submittal and prepare coordination details and erection diagrams for complete system.

3. Show in this submittal that window wall systems and metal wall panel systems haves received prior approval of Contractor, installer Subcontractors**,** and manufacturer or fabricator of each principal component including metal, glass, sealants and gasketing components.

B. Professional Certification: Provide Shop Drawings and engineering calculations signed and sealed by a Registered Professional Engineer, licensed in Project jurisdiction.
   1. Include certification by Registered Professional Engineer licensed in Project jurisdiction, that window wall systems and metal wall panel systems as designed meet or exceed specified performance requirements.

C. Product Data: Submit manufacturer's specifications and installation instructions for each component and finish.

D. Shop Drawings:
   1. Submit Shop Drawings for complete window wall system.
      a. Show plans, elevations and typical details of each condition for every member, joint, anchorage and glazing system.
      b. Show isometric joining and sealant details of all member intersection and corner conditions.
      c. Include hardware details, locations and mounting heights, including rough-in of electronic accessories/fixtures.

E. Hardware Schedule:
   1. Submit hardware schedule for each door and operable window opening.
   2. Include catalog cuts and templates.
   3. Include listing of Owner furnished and installed security devices with each applicable set.
   4. Obtain templates from Owner for security devices scheduled for mortised application; assemble and submit with hardware schedule for coordination for factory premachining and reinforcing of doors and frames.

F. Samples:
   1. Storefront components:
      a. Submit three sample sets for each type of finish showing full range (high, middle and low) of color, texture and finish expected in completed Work.
      b. Prepare samples on specified alloy, temper and thickness of metal required for Work.
      c. Sample sets: Minimum three samples in each set.
      d. Samples size: Minimum 12 inch (300 mm) long for extrusions and 12 inch square (300 mm square) for sheet or plate.
   2. Samples for sealant adhesion and compatibility testing:
      a. Submit to sealant manufacturer for pre-construction testing.
      b. Size and quantity: As required by sealant manufacturer.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification data: Submit installer and manufacturer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

B. Calculations:
   1. Submit, for information only, engineering calculations verifying that maximum deflections and stresses do not exceed specified performance requirements under full design loading.
   2. Submit certification by Registered Professional Engineer licensed in Project jurisdiction, that window wall systems and metal panel systems as designed meet or exceed specified performance requirements.

C. Design Modifications: Submit for review any proposed variations in details or substitutions in materials required to meet specified performance requirements and to coordinate Work.

D. Test Reports:
   1. Submit certified test reports performed by recognized testing laboratory verifying that systems submitted for use on this Project have been previously tested and meet or exceed specified performance requirements.
   2. Submit certified data verifying adhesion qualities of proposed aluminum finishes and sealants through adhesion and peel testing.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit instructions which describe materials, devices and procedures to be followed in cleaning and maintaining systems.
   2. Include manufacturer's brochures describing the actual materials used in Work, including metal alloys, finishes, glass, sealants, gaskets and other major components.
   3. Include copy of submittal in Project information manual.

B. Warranties: Submit signed and dated warranties.

1.6 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Drawings indicate design concept, size, shape and location of various components. Conform to design, specified performance requirements and material selections.
   2. Design modifications:
      a. May be proposed by manufacturer to satisfy performance requirements.
      b. Conform to design and specified durability and strength.
      c. Maintain profiles and alignments shown.
   3. Size glazing channels to provide adequate bite on glass, minimum edge clearances and adequate width for sealants, as recommended by manufacturers of storefront systems, glass, and sealants.

B. Structural Performance Requirements:
   1. Comply with specified criteria, unless more stringent criteria is required by local authorities having jurisdiction.
   2. Design loads:
      a. Design, fabricate and install component parts so that completed systems, including glass, will withstand uniform positive and negative design wind pressures in accordance with ASTM E330, times design factor of safety.
      b. Design wind pressures: As indicated on Structural Drawings.

c. Seismic loads: As indicated on Structural Drawings.

3. Glass Statistical Factor (Safety Factor): Refer to Section 08 8000 GLAZING.
4. Thermal movement:
   a. Design, fabricate and install components to withstand thermal expansion and contraction forces resulting from an ambient temperature range of minus 5 deg F (minus 21 deg C) to plus 110 deg F (43 deg C) and surface temperature range of 5 deg F (minus 15 deg C) to 185 deg F (85 deg C) without causing buckling, undue stress on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.
   b. Design operable doors and windows to function normally over this temperature range.
5. Deflection at full loading:
   a. Limit deflection of each component part (other than glass) perpendicular to glass plane to the following values, of clear span (L) of component part, except for more stringent requirements specified herein. Measure deflection from gages located on framing members, and metal panels.
      1) For spans up to 13'-6" (4.1 m): L/175.
      2) For spans more than 13'-6" (4.1 m): L/240 + 1/4 inch (6 mm).
   b. Limit deflections of framing at parapet and soffit conditions to 2L/175, where L is length of cantilevered member, with maximum of one-half sealant joint depth between framing member and fixed building element, whichever is less.
   c. Limit deflections of members parallel to glass plane, when carrying full dead load, to 1/8 inch (3 mm) or 25% of glass bite design dimension, whichever is less, between member and top of fixed component immediately below.
   d. Limit deflection of glass-supporting members to l/300 of glass length for distance glass is supported.
   e. Limit deflection of members supporting structural glazing so that glazing adhesive will not be stressed beyond 20 percent of ultimate tensile strength.
   f. Base deflection calculations upon combination of maximum direct loadings, building deflections, internal stresses and erection tolerances.
   g. Provide minimum 1/16 inch (1.5 mm) clearance between members and operable components below.
   h. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
6. Design factor of safety:
   a. Design and fabricate structural components including members, glazing stops or gaskets, weldments, connection adhesives and sealants used as adhesives with factor of safety not less than 1.5 (i.e., failure of any structural component shall not occur at less than 1.5 times maximum "Design Wind Pressure" and "Design Loads" in accordance with ASTM E330).
   b. Failure is defined as breakage, disengagement or permanent distortion.
7. Building movement:
   a. Design systems to withstand building movements, including thermal movements, loading deflections, shrinkage and similar movements.
   b. Architect will furnish specific data on anticipated building movements as may be requested by Contractor.
   c.

C. Air Leakage and Water Penetration Performance Requirements:
   1. Design, fabricate and install systems, including joints between systems and other Work, to effectively prevent leakage of either water or air into building, both under specified test conditions and under any combination of specified performance requirements.
   2. Water penetration:
      a. Definition: Appearance of uncontrolled water, other than condensation, on indoor face of any part of wall, including in concealed spaces adjacent to or below the storefront system.
      b. Design system of gutters and weeps to drain water to exterior face of wall.
      c. Design system so no uncontrolled water penetration occurs when wall is tested in accordance with ASTM E331 with air pressure differential of 20 percent of inward design wind pressure, but not less than 6.24 psf (300 Pa).
      d. Design operable aluminum windows to meet water penetration requirements of ANSI/AAMA 101 for window types specified.
   3. Air leakage:
      a. Design system so that air infiltration does not exceed the following allowable infiltration rates when tested in accordance with ASTM E283 at static air pressure differential of 6.24 psf. (300 Pa).
      b. Fixed units: .01 cfm per square foot(.0015L/s per sq.m) 0.06 cfm per square foot (0.03 L/s per sq. m) for storefront on complete module or bay.
      c. Operable units: 0.37 cfm per foot (0.19 L/s per sq. m) of crack length.

D. Thermal-Break or Thermally-Improved System Requirements:
   1. Provide system tested to demonstrate resistance to thermal conductance and condensation, and tested to show adequate strength and security of glass retention.
   2. Provide aluminum components with integrally concealed low conductance thermal barrier, located between exterior materials and window members exposed on interior, eliminating direct metal-to-metal contact.
   3. If poured polyurethane thermal break systems are used, fabricate with mechanical interlock to prevent shrink back.

E. Entrance Door Performance Requirements:
   1. Design and fabricate doors to withstand operating loads which result from heavy traffic conditions using selected hardware, without permanent measurable deflections.
   2. Limit elastic deflections to provide normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility.
   3. Provide tight joints to minimize air leaks and to provide for no uncontrolled water on interior of building.

F. Sealant Compatibility Requirements: Verify adhesion qualities of intended finishes and coatings with sealants through adhesion and peel testing in conjunction with sealant manufacturer.

G. Visual Requirements:
   1. Metal surfaces: Fabricate surfaces exposed to view from materials which are smooth and free of surface blemishes. Do not use materials which have stains and discolorations, including welds, exposed in completed Work.
   2. Surface flatness and edges: Provide flat surfaces with machine cut edges and corners sharp and true to angle or curvature required.

1.7 QUALITY ASSURANCE

A. Installer/Manufacturer Qualifications:
   1. Firm or company which has specialized for a period of not less than 5 consecutive years in successful design, fabrication and installation of work similar to major components of Work indicated and required for this Project.
   2. Employ only experienced tradesmen with minimum 5 years successful experience in fabrication and installation of work.
   3. System design and engineering: Performed under direct supervision of a Registered Professional Engineer, licensed in Project jurisdiction.

B. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by curtainwall systems.
   1. Test a minimum of five samples of each metal, glazing, and other material.
   2. Prepare samples using techniques and primers required for installed systems.
   3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
   4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

C. Regulatory Requirements:
   1. Conform to applicable requirements of authorities having jurisdiction over Project.
   2. Electrically operated locking devices at egress openings: Connect devices, including security devices, to building fire and smoke/heat alarm system, so that when fire or smoke/heat devices are activated, the electric locking mechanisms will be disengaged and rendered inoperable allowing free, unrestricted egress through opening.

D. Reference Standards: Except as may be modified by governing authorities or these Specifications, comply with applicable provisions and recommendations of the following:
   1. AAMA “Aluminum Curtain Wall Design Guide Manual”.
   2. NAAMM “Metal Finishes Manual”.
   3. The Aluminum Association, Inc. “Specifications For Aluminum Structures”.

1.8 SAMPLE INSTALLATION

A. Prior to commencing Work and preceding pre-installation conference, provide sample installation of storefront system at locations to be determined based upon sequence of Work.

B. Size and Location: As indicated on Drawings.

C. Materials: Incorporate complete materials as required for finished Work.

D. Architect's Review:
   1. Architect will review sample installation for visual acceptance of workmanship.
   2. Obtain Architect's approval of in-place mock-ups before proceeding with subsequent Work.

E. Maintain accepted in-place mock-up during construction as standard for subsequent Work.

F. Properly finished and maintained in-place mock-up may be incorporated into completed Work.

G. Dismantle unacceptable in-place mock-up and remove from site.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work. Include detailed discussion on coordination of electronic hardware rough-in.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver fabricated units and component parts to site identified in accordance with erection diagrams prepared by manufacturer.

B. Store in accordance with manufacturer's instructions, above grade on dunnage, properly protected from weather and construction activities.

1.11 PROJECT CONDITIONS

A. Verify dimensions of supporting structure at site by accurate field measurements so that Work will be accurately designed, fabricated and fitted to structure. Tolerances for supporting structure are specified in other Sections.

B. Fabrication and erection procedures shall take into account ambient temperature range at time of respective operations.

1.12 SEQUENCING AND SCHEDULING

A. Coordinate storefront Work with contiguous Work and provide components at proper time and sequence to avoid delays in overall Work.

1.13 WARRANTY

A. Provide 5 year written warranty signed by Contractor, Subcontractor(s), Installer and manufacturers agreeing to repair or replace defective materials or workmanship, including any evidence of early deterioration, weathering or aging of Work, uncontrolled water penetration or air infiltration, glass breakage, deterioration of finishes, failure of operating parts to properly function and any other deterioration or failure of Work to conform to Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

1. Acceptable Products and Manufacturers: Kawneer.
2. YKK.
3. Efco.
4. SpecialLite.

5.
6. Equivalent systems by following manufacturers may be acceptable provided they can meet performance and finish requirements and design profile limitations, including certified test reports showing compliance with referenced United States standards at time of submittal.
   a. VistaWall Architectural Products.
   b. Wausau Window and Wall Systems.
   c. YKK AP America, Inc.
   d. OldCastle.

2.2 MATERIALS

A. Aluminum Extrusions:
   1. Shapes and thicknesses as indicated and as required to fulfill performance requirements, but not less than 1/8 inch (3 mm) thick, unless otherwise indicated.
   2. Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and plate: ASTM B209.
      b. Extruded bars, rods, profiles, and tubes: ASTM B221.
      c. Extruded structural pipe and tubes: ASTM B429.
      d. Structural profiles: ASTM B308.
      e. Welding rods and bare electrodes: AWS A5.10.

B. Aluminum Sheets and Plates:
   1. Sizes and minimum gages as indicated and as required to fulfill performance requirements.
   2. Suitable alloy for forming and fabrication requirements with adequate temper and structural characteristics and suitable for finishing as specified.

C. Carbon Steel: High strength, low alloy products or structural steel as required to fulfill performance requirements.

D. Glass and Glazing:
   1. Spacers, setting blocks, gaskets, and bond breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and system performance requirements.
   2. Glazing sealants and glass: See Section 08 8000 GLAZING.
   3. Core Learning Spaces Sound Transmission Class (STC): Provide glazed windows rated not less than 35 STC when tested for laboratory sound transmission loss in accordance with ASTM E90 and ASTM E413.

2.3 COMPONENTS

A. Aluminum Framing System:
   1. Glazing channel: Minimum clearance for thickness and type of glass indicated in accordance with GANA requirements or manufacturer's recommendations.
   2. Provide outside glazing.
   3. Design to accommodate components indicated including operable doors.
   4. Design framing so panels can be removed from outside of building.
   5. Provide the following components:

a. Thermally-broken aluminum adapters as required to accommodate components indicated including operable doors.
b. Fiberglass pressure plates for enhanced thermal performance, of profiles and dimensions as indicated on Drawings and as recommended by manufacturer.

6. Framing members:
   a. Provide end caps for glazing members and receptor frames which are open-ended extrusions, to allow for continuous uninterrupted bond surface for perimeter sealants.
   b. Mechanically-fasten end caps, and fully seal on back side of each end cap to adjacent framing member profile using silicone sealant; fill voids, screw bosses, and similar irregularities with sealant.
   c. Steel reinforcement: As required by manufacturer.
7. Framing anchors:
   a. Provide anchors that permit three way adjustment to accommodate fabrication and construction tolerances.
   b. Use materials and protective coating recommended by manufacturer.
8. Flashing: Corrosion resistant, non-staining, non-bleeding and compatible with adjoining materials.

B. Miscellaneous Trim and Closures:
1. Form from brake formed or extruded aluminum, minimum 0.06 inch (1.5 mm) thick, to profiles and dimensions shown.
2. Form bends smooth and true.
3. Provide flush meeting edges without metal-to-metal laps at joints.

2.4 ACCESSORIES

A. Fasteners:
1. Provide fasteners for attachment of components to structural supports and for connecting components as recommended by component manufacturers and selected to prevent galvanic action with components fastened.
2. For embedment in masonry or concrete, provide zinc plated fasteners, conforming to requirements of ASTM B633 for Class FE/ZN 8, service condition SC2 (moderate) with Type II finish meeting corrosion resistance requirements after 96 hour salt spray test, unless otherwise selected by manufacturer.
3. For attachment of aluminum components, provide AISI 300 series stainless steel.
4. Provide concealed fasteners, except where indicated or where shown and accepted on final Shop Drawings. Where exposed in finished surfaces, use oval-head countersunk Phillips heads with color to match adjacent surfaces.

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.

C. Reinforcing and Joining Materials:
1. Steel angles, plates, bars, rods and other steel accessories: Hot-dipped galvanized, or if galvanizing is not compatible with alloy of component parts, shop painted with manufacturer's standard standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

a. Structural shapes, plates, and bars: ASTM A36.
b. Cold-rolled sheet and strip: ASTM A1008.
c. Hot-rolled sheet and strip: ASTM A1011.

2. Aluminum angles, plates, bars and other aluminum accessories: Alloys as recommended by manufacturer or fabricator to develop required strength of assembly.

D. Inserts: Galvanized steel or cast iron inserts of suitable design and adequate strength for condition of use.

E. Concealed Flashing: Dead soft stainless steel, 26 gage minimum (.5 mm minimum), or extruded aluminum (1.6 mm minimum thickness), of alloy and type selected by manufacturer.

F. Slip and Separator Gaskets: Types and materials as recommended by manufacturer for joint condition.

G. Galvanizing Repair Paint: High zinc-dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with SSPC Paint 20.

2.5 FABRICATION

A. Fabricate in accordance with final Shop Drawings and component manufacturer's instructions.

B. Fit and assemble Work in shop insofar as practicable. Mark and disassemble units which are too large for shipment to Project site, retaining units in sizes as large as possible for shipment and erection.

C. Complete welding, cutting, drilling and fitting of joints prior to chemical treatment and application of finishes.

D. Welding:
1. Weld with electrodes and by methods recommended by aluminum manufacturer and in accordance with applicable recommendations of AWS.
2. Use only methods which will avoid distortion or discoloration of exposed faces.
3. Grind weld areas smooth and restore finish before proceeding with other treatment.

E. Reinforce members and joints with steel plates, bars, rods or angles as required for rigidity and strength and as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.

F. Separate dissimilar metals or alloys with heavy coating of bituminous coating or other suitable permanent separation as required to prevent galvanic action.

G. Conceal fasteners unless otherwise indicated or otherwise shown and accepted on final Shop Drawings.

H. Carefully fit and match Work with continuity of line and design, using rigidly secured joints with hairline contact unless otherwise shown.

I. Finish Hardware:

1. Premachine and reinforce members to receive finish hardware in accordance with final Hardware Schedule and hardware manufacturer's instructions using templates furnished by each manufacturer.
2. Premachine and reinforce doors and frames to receive concealed contacts (position switches) and concealed associated wiring, as indicated on hardware schedule; one contact per leaf. See DIVISION 28 for contacts and wiring.

2.6 SHOP FINISHES

A. Fluoropolymer Resinous Coating: Manufacturer's standard fluoropolymer coating, custom color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with final Shop Drawings and manufacturer's instructions and recommendations for installation of Work.
   1. For mullion covers (glazing caps) other than manufacturer's standard profiles, secure cover plates to pressure plate with field-applied stainless steel screws, in addition to snap-on attachment. Paint screw heads to match color of color plates.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.

B. Erection Tolerances:
   1. Variations from plumb or any dimensioned angle shown: +/- 1/8 inch (+/- 3 mm) maximum in any story height or 10 foot (3 m) run, non-cumulative.
   2. Variations from level: +/- 1/8 inch (+/- 3 mm) maximum in any column-to-column space or 20 foot (6 m) run, non-cumulative.
   3. Variations from theoretical calculated position as located in plan or elevation in relation to established floor lines, column line and other fixed elements of the structure, including variations from plumb, level, straight and member size: 1/4 inch (6 mm) maximum variation in any column-to-column space or floor-to-floor height, or 20 feet (6 m).
   4. Offsets in end-to-end or edge-to-edge alignment of consecutive members: 1/16 inch (1.5 mm).

C. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

E. Set continuous sill members and flashing in full sealant bed to produce weathertight installation.

F. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

G. Install glazing as specified in Section 08 8000 GLAZING.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-installed entrance door hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

I. Repair damaged galvanized coating in accordance with ASTM A780.

J. Apply sealants in accordance with requirements of Section 07 9200 JOINT SEALANTS.

3.3 FIELD QUALITY CONTROL

A. Perform tests in presence of Owner's independent testing agency.

B. Coordinate testing requirements with Commissioning Agent.

C. Water Penetration Tests:
1. Contractor is responsible for costs of initial testing, and additional testing if required, including costs of architect and Owner's independent testing agency associated with witnessing additional testing.
2. Static air pressure difference test: Conduct in accordance with ASTM E1105 at uniform static air pressure difference of 6.24 psf (300 Pa) on areas indicated on Drawings.
3. Check weather stripping to ensure air infiltration is within tolerance as required by Commissioning Agent.
4. Water spray test without air pressure difference:
a. Upon completion of installation of wall framing on lower two typical floors of building and with at least 75 lineal feet (23 meters) of area fully glazed (including nominal curing of sealant and glazing compounds), but before installation of interior finishes, check wall for water penetration in accordance with “Specifications for Field Check of Metal Curtain Wall for Water Leakage” AAMA Standard 501.2.
b. Architect will designate areas to be tested.
c. Test area: Two bays wide (but not less than 30 feet (9 m)) by two stories high.

D. Depending upon prevalence or absence of leakage in initial water penetration test, and upon measures adopted by Contractor to eliminate sources of leakage, Architect will determine necessity for (and scope of) additional tests.

E. Correct units not meeting specified requirements, and re-test until units comply with specified requirements.

3.4 PROTECTION AND CLEANING

A. In addition to specific protection and cleaning methods required for each component part and recommended by respective manufacturers, maintain window wall throughout construction period in clean and properly protected condition so that it will be without any indication of use or damage at time of acceptance.

B. Carefully select and apply cleaning and maintenance methods so that finishes will not become uneven or otherwise impaired as result of unequal exposure to light and weathering conditions.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Finish hardware and related accessories.
   2. Security system hardware devices and coordination.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 08 1113 HOLLOW METAL DOORS AND FRAMES for steel doors and frames.

B. See Section 08 2130 FRP AND ALUMINUM ENTRANCE DOORS.

C. See Section 08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS for hardware for aluminum and glass doors and frames.

D. See Division 28 for security system requirements.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Submit copies of manufacturer's specifications, maintenance and keying manuals, and installation instructions for each item of finish hardware.
   2. Include photographs, catalog cuts, marked templates and other data as may be required to show compliance with these Specifications.

B. Samples:
   1. Submit full size hardware samples as requested by Architect.
   2. Samples will be returned to Contractor for use in Project.

C. Door Hardware Schedule: Submit door hardware schedule covering complete identification of every item required for each opening.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page. Horizontal hardware schedules are not acceptable.
   2. For doors of different sizes or where hinges, locks or closers are different, a separate heading shall be used. No labeled opening shall be combined with non-labeled openings. Schedule not adhering to these parameters shall not be reviewed.
   3. Content: Include the following:
      a. Number, location, hand, fire rating and material of each door opening (hands and swings to be determined in relation to key side of opening)
      b. Type, style, function, size and quantity of each hardware item
      c. Name and manufacturer of each item

d. Fastening requirement
e. Explanation of abbreviations, symbols and codes contained in schedule
f. Special mounting locations and instructions
g. Wiring diagrams (after each corresponding opening)
h. Keying information

4. Include separate schedule of key and master key system indicating the Owner's approved keying system with final submittal of schedule.
5. Include listing of security devices with each applicable set.
6. Architect's review of hardware schedule shall not be construed as complete check, nor shall it relieve Contractor of responsibility for errors, deviations or omissions from requirements to provide complete hardware for Project.

1.4 INFORMATIONAL SUBMITTALS

A. Hardware Schedule Index: Furnish an index cross referencing door number, Architect's hardware group and supplier's hardware group.

B. Wiring Diagrams: Furnish wiring diagrams showing point-to-point hook-up of all electrical hardware specified herein. Diagrams shall be complete by opening and shall include connections between all components affected.

C. Qualification Data: Submit supplier and installer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.5 SYSTEM REQUIREMENTS

A. Detail Requirements:
1. Assume sole responsibility for provision, coordination and function of finish hardware required for every opening, whether or not listed in hardware set schedule.
2. Coordinate application of hardware items with door and frame details and with specified methods of fastening.
3. Before ordering materials, carefully examine Shop Drawings of Work receiving hardware, and verify that products selected will properly fit.
4. Adaptation of hardware items:
   a. Where trim of one manufacturer is applied to another manufacturer's mortise lock or latch devices, modify and factory fabricate trim components, including spindles and other required attachment devices, as required to precisely fit specified mortise lock or latch components.
   b. Make modifications to provide proper operation of lock or latch function.
   c. Design, fabricate and install mechanism providing support and attachment of lever trim so that levers are, and will remain, completely horizontal and level in final installation.

B. Templates:
1. Make finish hardware to templates, with wood and/or machine screws applicable to door and frame details.
2. Furnish templates and schedules to door and frame manufacturers and other trades requiring them, so that doors and frames can be cut, reinforced and prepared in the shop to receive finish hardware.

C. Access Control Devices:
   1. At doors indicated to be "equipped with security devices", coordinate with Access Control System Vendor and assemble a package of templates for all door and frame mounted devices. Include these templates with package described above, to door and frame manufacturers and other trades.
   2. It is the responsibility of this Contractor to ensure that doors and frames are factory prepared for all door and frame mounted security devices.

D. Regulatory Requirements:
   1. Conform to applicable requirements of authorities having jurisdiction over Project.
   2. Hardware at labeled openings:
      a. Furnish hardware conforming to NFPA Standard No. 80 for fire-rated openings or openings designated to receive UL label.
      b. In case of conflict between specified hardware and type required for fire protection, furnish type required by NFPA and UL, and as suitable for indicated door and frame construction.
      c. Furnish UL-listed hardware for use with types and sizes of fire doors and frames required.
      d. Arrange doors at fire-rated openings to remain in normally closed position (except where electro-magnetic closer/hold-opens or electro-magnetic releases are scheduled) by providing automatic closing device for each unit.
      e. Furnish active latch bolts, of UL approved throw, that cannot be held in retracted position where required.
   3. Electrically operated locking devices at egress openings: Connect devices to building fire and smoke/heat alarm system, so that when fire or smoke/heat devices are activated, the electric locking mechanisms will be disengaged and rendered inoperable allowing free, unrestricted egress through opening. Devices must be hard wired; wireless is not acceptable.

E. Existing Openings:
   1. Where new hardware components are scheduled for application to existing construction or modifications to existing hardware are required, field verify and coordinate devices as required to suit opening conditions and to provide for proper operation of new installation.
   2. Cut and patch existing Work as required.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to that required for this Project.

B. Supplier Qualifications:
   1. Firm or company specializing in architectural finish hardware with not less than 5 years documented, successful experience with work comparable to that required for this Project.
   2. Hardware supplier shall have within his organization competent hardware consultant who shall be member in good standing of American Society of Architectural Hardware Consultants. Consultant shall be available and subject to call for consultation and cooperation with Architect, Owner and Contractor throughout progress of construction.

C. Regulatory Requirements:
   1. Conform to applicable requirements of authorities having jurisdiction over Project.

2. Except as may be modified by governing authorities, comply with applicable requirements and provisions of the following:
   a. CABO/ANSI A117.1 "Accessible and Usable Buildings and Facilities".
   b. Americans with Disabilities Act.

D. Reference Standards: Except as otherwise required by governing authorities or Contract Documents, comply with applicable provisions of Door and Hardware Institute.

1.7 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work. Ensure attendance by supplier/vendors and installers/subcontractors to ensure effective cross coordination between scopes. GC must ensure documentation is on file confirming all approved door-hardware submittals must have been shared between interfacing doors-frames-hardware vendors & subcontractors.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery, Packing and Marking:
   1. Deliver hardware separately packaged, labeled with manufacturer's name, type, number and name of item.
   2. Tag each package with same number designated in approved hardware list.
   3. Include necessary screws, keys, instructions, and installation templates in each package.

B. Storage and Handling: Inventory and store hardware in securely locked, dry and protected area.

1.9 OPERATION AND MAINTENANCE

A. Furnish Owner with one complete set of installation instructions including manufacturers' catalogs, special adjusting tools and maintenance instructions. One condensed catalog shall be furnished for each manufacturer listed in the approved hardware schedule.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Butt Hinges:
   1. Listed product: Hager Companies.
   2. Other acceptable manufacturers:
      a. IVES Hardware
      b. Bommer
      c. Mckinney
      d. Stanley Commercial Hardware

B. Continuous Hinges:
   1. Listed product: Select Products Limited

C. Pivots:
   1. Listed product: Rixson- an ASSA ABLOY company.

2. Other acceptable manufacturers:
    a. Allegion-LCNs

D. Pocket Pivots:
1. Listed product: Rixson- an ASSA ABLOY company. Other acceptable manufacturers:
    a. McKinney

E. Locksets and Latchsets:
1. Listed product: Allegion-Schlage Lock Co.
2. Other acceptable manufacturers:
    a. Corbin-Russwin Architectural Hardware
    b. Sargent Mfg. Co.
    c. ASSA ABLOY Door Security Solutions
    d. PDQ Manufacturing.

F. Cylinders
1. Listed product: Allegion-Schlage Lock Co.

G. Electric Locks:
1. Listed product: Security Door Controls
2. Substitutions will not be accepted

H. Electric Strikes:
1. Listed product: HES (an ASSA ABLOY Group company).
2. Other acceptable manufacturers:
    a. Security Door Controls
    b. Allegion-Von Duprin

I. Closers:
1. Listed product: Allegion-LCN Closers
2. Other acceptable manufacturers:
    a. Corbin-Russwin Architectural Hardware
    b. ASSA ABLOY Door Security Solutions

J. Electromagnetic Releases:
1. Listed product: Rixson- an ASSA ABLOY company
2. Other acceptable manufacturers:
    a. Allegion-LCN

K. Automatic Flush Bolts, Coordinators:
1. Listed product: Allegion – Ives
2. Other acceptable manufacturers:
    a. Door Controls International
    b. Hager Companies

L. Stops, Manual Flush Bolts, Auxiliary Hardware:
1. Listed product: Allegion – Ives
2. Other acceptable manufacturers:
    a. Hager Companies
    b. Rockwood Mfg. Co.

M. Overhead Stops/Holders:
   1. Listed product: Allegion – Glynn Johnson
   2. Other acceptable manufacturers:
      a. Architectural Builders Hardware
      b. Rixson- an ASSA ABLOY company

N. Pulls, Flat Goods:
   1. Listed product: Hager Companies
   2. Other acceptable manufacturers:
      a. Builder's Brass Works
      b. Rockwood Mfg. Co.
      c. Trimco.

O. Weatherstripping, Seals, Sweeps, Thresholds:
   1. Listed product: Pemko, Inc.
   2. Other acceptable manufacturers:
      a. Hager Companies
      b. National Guard Products, Inc.
      c. Reese Enterprises, Inc.
      d. Zero International

P. Sliding Door Hardware:
   1. Listed product: Hetich
   2. Other acceptable manufacturers:
      a. Hager Companies
      b. P.C. Henderson

Q. Key Lock Boxes:
   1. Listed product:
      a. Global Industries
      b. Other acceptable manufacturers or equal

FINISH HARDWARE

A. Finishes:
   1. Scheduled finishes are derived from ANSI A156.18. Provide finishes complying with this standard.
   2. Base Metals:
      a. Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy composition, temper and hardness, but in no case of lesser quality than specified or inferred by use of a particular manufacturer's number, style or grade or as established by appropriate referenced specification listed herein.
      b. All exposed hardware except exit devices, closers, push-pulls and flat goods shall be Satin Chrome Plated, ANSI 626 (US26D). Closers shall be painted to match satin chrome. Hinges shall be Satin Chrome Plated, ANSI 626 (US26D) where ferrous base metal is specified.

B. Hinges:
   1. Comply with ANSI/BHMA A156.1.

2. Pack hinges with machine or wood screws as required by door and frame construction.
3. Quantities per door leaf: Furnish two hinges for doors 60 inches (1.5 m) or less in height and one additional hinge for each additional 30 inches (750 mm) or fraction thereof.
4. Sizes:
   a. Unless otherwise indicated, hinges for doors through 36 inches (900 mm) wide shall be 4-1/2 inch x 4-1/2 inch (113 mm x 113 mm). Hinges for doors over 36 inches (900 mm) wide shall be 5 inch x 4-1/2 inch (125 mm x 113 mm). Hinges for labeled doors shall comply with requirements of NFPA 80.
   b. Where door jamb or trim projects to such an extent that width of leaf specified will not allow door to clear such frame or trim, furnish hinges with leaves of sufficient width to clear.
5. Hinge knuckle design shall be the type and grade listed.
6. Provide non-removable pins (NRP) for reverse bevel doors receiving keyed locks, rigid outside trim or "exit only" hardware.
7. Fabricate hinges with holes in bottom plug to facilitate pin removal.
8. Hinges with anti-friction bearings may be provided in lieu of ball bearings hinges except for doors over 36 inches (900 mm) wide. Fire doors shall comply with requirements of NFPA 80.

C. Pocket Pivots:
1. Comply with ANSI A156.1.
2. Quantities per door leaf: Provide two pocket pivots for doors 60 inches (1.5 m) or less in height and one additional pocket pivot for each additional 30 inches (750 mm) or fraction thereof except where continuous hinges are indicated.
3. Pocket pivots for labeled doors shall comply with the requirements of NFPA 80.

D. Mortise Locks and Latches:
1. Heavy-duty commercial mortise type, complying with ANSI/BHMA A156.13, Series 1000, Grade 1 Operational, at least Grade 3 Security.
2. Furnish mortise type lock and latch sets with stainless steel anti-friction deadlocking latchbolts.
3. Furnish complete with trim, extended spindles as required to suit door thickness, armor fronts and 6 pin cylinders.
4. Provide knurling or abrasive coating to lever on corridor side of door, on side of lever facing door, for scheduled doors.
5. For each lock and latchset provide strike box and square corner ASA strike with curved lips of sufficient length to protect frames.
6. Mortise deadlocks: Furnish with same turnpiece and cylinder trim as furnished for lock sets.
7. Electrified mortise locks shall draw a maximum of 250 milliamps of current at 24VDC.
8. Function: Provide as scheduled.

E. Cylinders:
1. Comply with ANSI A156.5.
2. Provide cylinder length as required to suit door thickness, complete with collars and cams as required for complete installation.
3. Provide 3216, LFIC, Schlage C Keyway cylinders with cams to suit lock functions.
4. Provide 7-pin interchangeable-core cylinders with temporary inserts for construction period. Permanent cores shall be furnished directly to Owner by manufacturer.

5. Provide cylinders and coordinate requirements with other assemblies requiring locks, including storefront and overhead coiling doors.
6. Manufacturer: Schlage.
7. Refer to Keying Guidelines Document for additional information.

F. Electric Locks:
1. UL-listed, electric-controlled heavy-duty commercial mortise lock with 3/4 inch (19 mm) deadlocking latch bolt; fail-safe operation.
2. Provide with power booster (supply).
3. Fabricate with electric controller in frame, not requiring wiring through door.
4. Fabricate to work with scheduled mortise lock manufacturer's lockset, modified to work with controller. Furnish complete with trim, armor fronts, and 6 pin cylinders, extended spindles as required to suit door thickness
5. Conceal fastenings, washers and bushings.
6. Function: Provide as scheduled.
7. Trim: Match trim design for mortise locksets.

G. Electric Strikes:
1. Comply with BHMA 501, Grade 1
2. Provide heavy duty, cast construction strikes, function as indicated.
3. Electric strikes shall draw a maximum of 250 milliamps of current at 24VDC.
4. Units shall be solenoid-actuated and tamper-resistant, and listed by a testing agency acceptable to authorities having jurisdiction for both burglary protection device and fire door accessory.
5. Provide normally-locked application, with fail-secure operation so that doors remain locked in the event of a power failure.

H. Exit Devices:
1. Comply with ANSI/BHMA A156.3, Grade 1.
2. Furnish with provision for concealed mounting; through bolts will not be acceptable.
3. Furnish complete with extended spindles as required to suit door thickness.
4. Furnish keyed devices less cylinders; provide cylinders keyed to building system.
5. Provide UL-labeled fire-exit hardware at fire-rated openings.
6. Provide keyed removable mullions, weather stripped, and complete with stabilizers for a secure installation. Where indicated, factory prepare mullions for electric strike installation.
7. Electric latch retraction:
   a. Provide with power booster (supply) and power transfer.
   b. Operation:
      1) When security system is “on”, exit device shall automatically unlock upon receipt of valid signal from card reader or activation of infra-red sensor.
      2) When security system is “on”, exit device shall automatically unlock upon activation of fire and heat/smoke alarm system.
      3) Provide fail secure application so that when security system is “on”, doors remain locked in event of power failure.
   c. Electric dogging:
      1) Provide electric dogging, to automatically dog (unlock) devices when security system turns “off” and to automatically undog (lock) devices when security system turns “on”, under normal operation of security system.
      2) Electric dogging is not permitted for fire-rated doors.

d. Coordinate with installation and operation of power door operators, security system and fire/smoke alarm system.

8. Function and trim:
   a. Provide as scheduled.
   b. Where lever handle trim is specified, levers shall match the design of levers specified for locksets and latchsets.

I. Closers:
1. Comply with ANSI/BHMA A156.4, Grade 1.
2. Closers shall be of heavy duty cast iron or cast aluminum construction. Arms shall be heavy-duty solid forged steel.
3. Where factory sized closers are specified, sizes are to be determined by manufacturer's recommendations for door size, location and applicable accessibility requirements.
4. Closers shall have full rack and pinion, independent closing speed and latch regulating valves, and adjustable backcheck.
5. Furnish for 180 deg door opening where partition construction will permit.
6. Provide regular arm or parallel arm closers as required to mount closer on least visible (to public) side of door.
7. Covers: Metal. Plastic covers are not acceptable.
8. Provide complete with accessory items and attachments, including special arms, soffit shoes, drop plates.
   a. Corner bracket installations are not acceptable.
   b. Closers, covers, brackets and other components shall not extend below bottom of top horizontal rail of door.

J. Electro-Magnetic Releases:
1. Comply with ANSI/BHMA A156.15.
2. Connect devices to fire or smoke/heat alarm system via dry contacts, so that when alarm devices are activated, or there is power loss in building, electromagnetic releases will automatically release and closers will close doors.
3. Utilize line voltage for power, not fire alarm system's low voltage power supply.
4. Coordinate voltage requirements with Division 26.

K. Power-Assist Operators:
1. Comply with ANSI A156.19.
2. Description:
   a. Combination manual door closer and electro-mechanical low-energy power door operator; switch activated; offset-pivot surface mounted.
   b. Unit shall be designed to operate doors weighing up to 250 pounds.
3. Operation:
   a. MANUAL mode: Operator functions as manual door closer, complying with requirements for closers as specified above in this Section.
   b. HANDICAP mode: Pressing switch automatically opens door leaf to 90 deg, operator then manually closes door after variable time delay expires.
4. Provide manufacturer's wall-mounted stainless steel actuator plates, with face dimensions approximately 5 1/2-inches square.
   a. Deboss or engrave Universal Accessibility Symbol on plate; fill with blue enamel paint.
   b. Provide one interior switch and one exterior switch per operator.
5. Control unit:

a. Micro-processor controlled.
b. Provide adjustable opening speed, adjustable backcheck speed, adjustable closing speed, and adjustable hold-open period.
c. Provide built-in 3-position switch for "OFF", "ON" and "HOLD-OPEN" operation and to deactivate exterior actuator switch.
d. Provide safety-stop feature: If object or obstruction is encountered during opening and/or closing cycles, door operator stops and slowly returns to closed or open position respectively.
e. Provide with safety circuit so that if actuator switch is activated when door is latched or locked, power operator resets without solenoid or motor burn-out.

6. Accessories:
   a. Provide with continuous aluminum cover with an anodized ANSI 313 finish**,** full width of door.
   b. Furnish complete with fastenings, fittings, and other accessories as required for a complete installation.
7. Coordinate voltage requirements with Division 26.

L. Flush Bolts, Dust Strikes, and Coordinators:
1. Comply with ANSI/BHMA A156.3 for automatic flush bolts, and ANSI/BHMA A156.16 for manual flush bolts and dust strikes.
2. Provide products suitable for use with indicated door (wood veneer mineral core or hollow metal) and frame construction, and acceptable to door and frame manufacturers.
3. Furnish in pairs (top and bottom of door).
4. Surface mounted flush bolts are not acceptable.
5. Comply with ANSI A115.4.
6. Furnish standard strikes with wrought boxes for top bolts.
7. Automatic flush bolts: Are not acceptable.
8. Dust strikes: Are not acceptable. All doors with flush bolts shall be Less Bottom Rod (LBR).
9. Coordinators: Are not acceptable.

M. Overhead Stops/Holders:
1. Comply with ANSI/BHMA A156.8, Grade 1.
2. Holder sizes: As recommended by manufacturer for size of door and application in consideration of details indicated.
3. Stops and holders shall be concealed or surface mounted as scheduled, non-handed with shock absorbing coil springs with rubber inserts. Arms and channels shall be made of extruded bronze.
4. Provide concealed overhead stops equal to Allegion - Glynn-Johnson 410S. Install wall or floor stops where overhead stops/holders are not suitable.

N. Wall and Floor Stops:
1. Comply with ANSI/BHMA A156.16.
2. Provide attachment devices as suitable for substrates.
3. Provide risers for floor stops as required to coordinate with undercuts, thresholds, carpet or other finish materials.
4. Type:
   a. Unless otherwise scheduled, provide wall stops equal to Ives WS402CVX wherever trim strikes wall.

b. Where wall stops are not suitable, provide floor stops equal to CRL Satin Chrome Floor Mounted Heavy-Duty Door stop with hook and holder or approved equal.
   1) Exclude hook and holder where not allowed by code.

O. Flat Goods:
1. Comply with ANSI A156.6.
2. Bevel kick plates, mop plates and armor plates 3 sides.
3. Minimum thicknesses: 0.050 inch thick for stainless steel; 0.064 inch thick for bronze.
4. Furnish flat good with Phillips undercut, countersunk screws per ANSI A156.6. Trusshead screws are not acceptable.
5. Kick plates and armor plates: Unless otherwise indicated or where narrow bottom rails dictate a smaller size, kick plates shall be 10 inches high and armor plates 34-inches high (16-inches on labeled doors). Width shall be 1-1/2 inches less than door width on single doors and 1 inch less than door width on double doors.
6. Push and pull plates:
   a. Unless otherwise indicated, push and pull plates shall be 4 inches x 16 inches.
   b. Cut plates for cylinders and turn pieces as required.
7. Kick and armor plates shall be equal to Hager Companies series 194S.

P. Silencers:
1. Comply with ANSI/BHMA A156.16.
2. Fabricate silencers with projection to snap into punched holes in metal frames, and fit into drilled holes in wood frames. Adhesive-type silencers are not acceptable.
3. Do not provide silencers where seals or weatherstripping are scheduled. Omit silencers at doors with aluminum frames.
4. Provide 3 for single doors, and 2 for pair of doors.
5. Acceptable products and manufacturer:
   a. For metal frames: Ives SR64.
   b. For wood frames: Ives SR65.

Q. Seals and Weatherstripping:
1. Provide seals and weatherstripping as scheduled, continuous around door heads and jambs.
2. Provide only units in which resilient or flexible seal strip is easily replaceable in field, and is readily available from stocks maintained by manufacturer.
3. Metal components: Extruded aluminum; finish as scheduled.
4. Resilient components: Neoprene, vinyl, or silicone, as scheduled.
5. Positive pressure doors: At doors indicated to be “20-minute” in door schedule, provide head, jamb and astragal intumescent seals.

R. Thresholds:
1. Fabricate from extruded aluminum, with continuous grooved top surface.
2. Provide in handicapped-accessible profile not more than 1/2 inch high, with bevel on each long edge.
3. Provide in lengths to suit door openings.
4. Furnish with continuous channel anchors for casting into slab or with expansion devices, and with countersunk flat head machine screws, for attachment to substrates.

S. Sliding Door Hardware:
1. Comply with ANSI A156.14.

2. Provide heavy duty units as scheduled including tracks, rollers, stops and all necessary appurtenances for complete assembly.

T. Key Cabinet:
1. Provide one key hook-style key cabinet sized for the number of keyed doors.

U. Other Devices and Accessories:
1. Provide as scheduled and as required for complete installation.
2. Furnish necessary special tools (eg. spanner and socket wrenches, dogging keys, etc.) required to adjust and maintain hardware items.

V. Electronic Key Management System
1. Provide one Key tracer 3U 8 Key Panel with proximity reader and keypad. Electric power and network connectivity are required. Install per the manufacturer's requirements.
2. KeyTracer shall be located behind a locked door.

W. Fasteners:
1. Furnish hardware items with appropriate type and length of screws or other fastenings suitable for permanent anchorage.
2. Provide concealed fastenings wherever possible.
3. Provide concealed fasteners for hardware items that are exposed when door is closed, except in application of flush mounted push and kick plates.
4. Through-bolts fastening is not acceptable. Coordinate with fire-rated wood door construction to eliminate through-bolts.
5. Provide countersunk Phillips oval head type screws where concealed fastening is not possible; match finish and color of hardware item being fastened. Provide flat head screws for hinges, and oval head screws for other items.

2.2 KEYS AND KEYING

A. Refer to Keying Guidelines and Key Turnover Protocol Guidelines.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install each hardware item in accordance with final Finish Hardware Schedule and manufacturer's instructions.
1. Set hardware level, plumb and true to line and location.
2. Adjust and reinforce attachment substrate as required for proper installation and operation of hardware.
3. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors uniformly, in accordance with industry standards.

B. Hardware Mounting Heights:
   1. Provide heights as indicated on Drawings, except as otherwise required to comply with governing regulations.
   2. Where heights are not indicated, comply with mounting requirements of DHI "Recommended Locations for Builder's Hardware" on custom steel doors and frames and CABO/ANSI A117.1 "Accessible and Usable Buildings and Facilities".

C. Hinges:
   1. Install steel doors and wood doors to comply with reference standards, as specified in door sections.
   2. Where shimming is required to comply with tolerances, provide metal shims only.

D. Closers:
   1. Do not install parallel arm closers until after weatherstripping or seals have been installed on head frame (where weatherstripping or seals are scheduled).
   2. Do not cut weatherstripping or seals for attachment of closer brackets or shoes.
   3. Adjust closers to control door swing and to provide positive latching of doors.
      a. Adjust closers not to exceed following manual opening forces:
         1) Exterior doors: As required to close and latch each leaf.
         2) Interior doors (non-fire-rated): Maximum 5 pound opening force.
         3) Fire-rated doors: As required to close and latch each leaf.
      b. After air handling system has been balanced, make final adjustment of all closers.
         1) Location of closers: Classroom doors and other locations indicated.

E. Door Stops:
   1. Install stops for maximum degree of door opening swing allowed by conditions of installation.
   2. Locate floor stops so as not to create a tripping hazard.
   3. Locate wall stops centered on spindle of lever handles.

F. Door Plates: Install plates on push side of single-acting doors, with flat (non-beveled) side facing floor.

G. Weatherstripping and Seals:
   1. Install continuous around door heads and jambs, and meeting stiles of pairs of doors.
   2. Install bottom weatherstripping and automatic door bottoms for full width of door.
   3. Do not cut weatherstripping or seals for attachment of closer brackets or shoes.

H. Thresholds:
   1. Scribe and cut to fit profiles of door frames, with mitered corners and tight joints. File burrs smooth.
   2. Install exterior thresholds in full bed of butyl rubber sealant. Do not plug drain holes or block weeps. Remove excess sealant.

I. Coordination with Adjacent Finishes:
   1. If cutting and fitting are required to install hardware onto or into surfaces which are later painted or finished in another way, install each item completely and then remove and store in secure place during finish application.
   2. After completion of finishes, reinstall each item.
   3. Do not install surface mounted items until finishes are complete on substrate.

J. Key Cabinet:
   1. Deliver one fully populated key cabinet with two copies of all keys and corresponding schedule to the Owner prior to building occupancy. Install in accordance with manufacturer's instructions in location as directed by Owner.
   2. Instruct Owner in use of key control system.

3.3 FINAL ADJUSTMENT

A. When hardware installation is made more than 1 month prior to Substantial Completion of Project, make final adjustments during week immediately prior to Substantial Completion and after completion of testing and balancing of building mechanical system, unless otherwise directed by Architect.
   1. Provide additional adjustments at the following intervals:
      a. At occupancy
      b. 90 days after occupancy
      c. 180 days after occupancy.

B. Adjust and check each operating item of hardware and each door, to ensure proper operation of function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended).

C. Test electro-magnetic hold-open devices in presence of Architect. Adjust devices and connections as required to provide proper operation.

D. Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for application made. Also replace defective, damaged, missing or stolen hardware.

E. Test security devices with operation of security system in presence of Owner. Adjust devices and connections as required to provide proper operation as acceptable to Owner.

F. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes.

G. Immediately before final completion of Work, carefully clean exposed hardware items by methods not injurious to their finish.

H. Protect hardware from damage until final acceptance.

3.4 FIELD QUALITY CONTROL

A. Construction team must perform regular QC inspections and submit reports for review by AE/QA personnel.

B. Reports must include inspection details for door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted per operational configuration.

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
      a. Windows.
      b. Doors.
      c. Glazed curtainwalls.
      d. Storefront framing.
      e. Glazed entrances.
      f. Interior borrowed lites.
      g. Unframed mirrors.
   2. Glazing materials and accessories.

B. Single Subcontract Responsibility: Provide glass and glazing under single subcontract.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 08 1113 HOLLOW METAL DOORS AND FRAMES for hollow metal doors and hollow metal framing systems.

B. See Section 08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS for aluminum framing systems in conjunction with window wall and glazing system requirements for entrance doors.

C. See Section 10 2813 TOILET ACCESSORIES for framed mirrors.

1.3 ACTION SUBMITTALS

A. Combined Submittal: Submit the following as a combined submittal with Work specified in 08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS and 084114 FRP ALUMINUM FRAMED ENTRANCE DOORS.

B. Product Data: Submit manufacturer's specifications and installation instructions for each type of glass required.
   1. Submit SWRI Validation Certificate for each glazing sealant specified to be validated by SWRI's Sealant Validation Program.
   2. Provide glazing schedule.
      a. List glass types and thicknesses for each site opening and location. Use same designation indicated on Drawings.

C. Samples:
   1. Glass:

a. Submit 12 inch (300 mm) square samples of each type of glass (except clear single lite glass and mirror glass).
b. Samples shall be typical production run quality and, as applicable, shall be complete with required tint, reflective and low emissivity coatings, fritted coatings, laminating films, opacifiers and primary and secondary edge seals.

2. Submit samples of manufacturer's standard color selections for glazing sealant for Architect's color selection.
3. Submit samples of glazing gaskets for Architect's approval of color.

1.4 INFORMATIONAL SUBMITTALS

A. Calculations: Provide glass manufacturer's thermal stress analysis, for the most critical exterior application.

B. Certificates:
1. Submit certificate from glass manufacturer stating that manufacturer has reviewed glazing details including use of sealants and gaskets and each product provided is recommended for application indicated, and that materials are compatible and will adhere to specified finish.
2. Submit certificate from glass manufacturer stating that manufacturer has reviewed application of heat absorbing or reflective glass for effects of partial or full shading (including locations and types of indicated interior window treatment) under expected service temperature ranges and that resulting thermal stresses will not reduce “Glass Statistical Factor” below 2.5.
3. Submit certificate for glass materials at “Hazardous Locations” showing compliance with requirements of CPSC 16CFR, Part 1201.
4. Submit certificate stating that glass units can withstand design loads.
5. Submit glass manufacturer’s review of Shop Drawings for window wall system, with recommendations and suggestions.

C. Qualification Data: Submit manufacturer and installer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
1. Submit cleaning and maintenance data for materials provided.
2. Include copy of submittal in Project information manual.

B. Warranties: Submit signed and dated warranties.

1.6 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Glass thicknesses when indicated (except for ornamental applications) are for convenience of detailing only and are to be determined by Contractor or glass manufacturer as required to fulfill performance requirements.
2. Glazing channel dimensions indicated are intended to provide necessary minimum bite on glass, minimum edge clearances and adequate sealant and/or gasket thickness within required tolerances.

3. Coordinate glazing systems with glazing channels to assure proper installation of systems.

B. Performance Requirements:
1. Refer to the following Sections for performance criteria pertaining to design of glass, glazing systems and framing members for glazing applications.
   a. Section 08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS and 084114 FRP ALUMINUM FRAMED ENTRANCE DOORS,
2. Glass Statistical Factor (Safety Factor):
   a. Provide glass of sufficient thicknesses that probability of breakage at "Design Wind Pressure" will not exceed 8 lites per 1000 lites (2.5 SF) at 60 second wind load.
   b. For glass inclined more than 15 deg from vertical, including glass for skylights, provide glass of sufficient thicknesses that probability of breakage at "Design Loads" will not exceed 1 lite per 1000 lites (5.0 SF) unless glass manufacturer specifically recommends, in writing, a lower SF.
   c. Provide glass manufacturer's data, on request, substantiating glass breakage data if such data is not otherwise available as manufacturer's published data.
3. Compatibility and adhesion: Provide glazing sealants, gaskets, and glazing accessories which are compatible with each other and with glass and glass framing members, and which will adhere to joint surfaces.
4. Preconstruction Adhesion & Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessories, and glass framing members for adhesion to and verify compatibility with elastomeric glazing sealants.
   a. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   b. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   c. Test three Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials
5. Provide watertight and airtight installation of glass.
6. Each installation must withstand specified performance requirements including normal temperature changes, wind loading and impact loading, without failure.

C. Fire-Protection-Rated Glazing Labeling:
1. Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.
2. For fire-protection-rated glazing, provide products identical to those tested in accordance with the following, and labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
   a. Fire-resistant glazing products for door assemblies: NFPA 252.
   b. Fire-resistant glazing products for window assemblies: NFPA 257.

D. Interface with Other Systems: Provide primary and secondary seals on insulating units that are compatible with sealant used for structural sealant glazing.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented successful experience in installation of work similar to Work of this Project, licensed or approved by glass manufacturer.

B. Single Source Responsibility:
1. Provide glass and glazing materials from one source for each type of glass.
2. Use same glazing material in each joint system unless material manufacturer recommends otherwise.

C. Manufacturer Qualifications:
1. Not less than 5 years documented successful experience in production of work similar to Work of this Project, with sufficient capacity to supply glass in a timely fashion.
2. Manufacturer of insulating glass units shall be a member of IGMA (Insulating Glass Manufacturers Alliance).

D. Regulatory Requirements:
1. Comply with applicable requirements of authorities having jurisdiction over Project.
2. Safety glazing requirements:
   a. Provide glass and glazing at "Hazardous Locations" complying with requirements of CPSC 16CFR, Part 1201, Consumer Product Safety Commission Standard on Architectural Glazing Materials, including required tests and labeling.
   b. Permanently mark each lite of safety glazing material with certification label acceptable to authorities having jurisdiction.

E. Reference Standards: Unless otherwise required to comply with regulatory requirements or otherwise recommended by fabricator to fulfill performance requirements, comply with the following:
1. AAMA "TIR-A Glazing Guidelines".
2. GANA "Glazing Manual".
3. IGMA TM-3000 "Glazing Guidelines for Sealed Insulating Glass Units".
4. IGMA TB-3001 "IGMA Guidelines for Sloped Glazing".

1.8 SAMPLE INSTALLATION

A. Prior to commencing Work, glaze one bay of each type of glazing system in area as acceptable to Architect.

B. Install sample installations to match final Work in every respect.

C. Install sample installations in presence of glazing materials manufacturer and glass manufacturer representatives, not less than one week in advance of scheduled glazing Work.

D. Architect's Review:
1. Architect will review sample installation for visual acceptance of workmanship.
2. Obtain Architect's approval of sample installation before proceeding with subsequent Work.

E. Accepted sample installations may remain in completed Work.

F. Dismantle unacceptable sample installations and remove from site.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work.

B. Attendees: Glass manufacturer's representative, glazier and fabricator of framing or other supporting structure receiving glass.

C. Agenda:
1. Review glazing procedure, application of glazing materials and installation of removable stops.
2. Evaluate suitability of specified compounds and sealants for anticipated weather conditions.
3. Review coordination with other Work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials in manufacturer's unopened packaging.

B. Glass shall bear manufacturer's labels indicating type and quality. Labels shall be left on glass until final cleaning, unless otherwise directed by Architect.

C. Store in accordance with manufacturer's recommendations.

D. Provide cushions at glass edges to prevent damage during handling or storage.

1.11 PROJECT CONDITIONS

A. Environmental Conditions:
1. Ensure that conditions of temperature, humidity and precipitation are as recommended by glass manufacturer.
2. Do not proceed with glazing when ambient or substrate temperature conditions are below 40 deg F.
3. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.
4. Do not perform any glazing Work when framing members are wet or frosted.

1.12 WARRANTY

A. Provide written 10 year warranties, made out to Owner and signed by glass manufacturer agreeing to furnish replacements for the following:
1. In manufacturer's warranties, “initial purchaser” shall refer to Owner.
2. Insulating glass units which have failed hermetic seal, fogging, reflective or low emissivity coating defects, breakage due to edge flaws (such as chips or gouges) or migration of edge spacers.
3. Laminated glass units which show evidence of delamination, deterioration of laminating films, loss of transparency or other forms of deterioration including edge separation due to defective materials or lamination, or breakage due to edge flaws (such as chips or gouges).
4. Coated or spandrel glass which show evidence of peeling, cracking or deterioration of coating or opacifier/scrim, or breakage due to edge flaws (such as chips or gouges).

5. Glass units with latent visual defects.
6. Mirrors which develop visible silver spoilage defects.

PART 2 - PRODUCTS

2.1 GLASS MATERIALS

A. Clear Float Glass:
1. ASTM C1036, Type I, Class 1, Quality q^3.
2. Minimum thickness: 6 mm.
3. Low-iron glass:
   a. Where indicated, provide ultra-clear (low-iron) glass, with minimum 91% visible light transmission and minimum solar heat gain coefficient of 0.87.
   b. Acceptable products and manufacturers:
      1) Krystal Klear by AGC Flat Glass North America
      2) Optiwhite by Pilkington Building Products North America.
      3) Starphire by PPG Industries, Inc.
      4) Amiran Water White by Schott Corporation.

B. Heat-Treated Glass:
1. General:
   a. Fabrication process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   b. For uncoated glass, comply with requirements for Condition A.
   c. For coated vision glass, comply with requirements for Condition C (other coated glass).
   d. Adjust temperature settings of heat-treating ovens to suit specific glass coatings, so as to minimize distortion and discoloration of coatings.
2. Fully tempered glass:
   a. ASTM C1048, Kind FT, of color and type indicated.
   b. Provide fully tempered glass certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
   c. Heat soak glass to comply with the following:
      1) Heat-soak test fully tempered glass in compliance with DIN 18516-4, BS EN 14179 or another recognized international standard acceptable to glass fabricator to convert nickel sulfide inclusions from the alpha phase to the beta phase, so that the glass will fracture in the test.
      2) Each pane of heat soak tested tempered glass shall be traceable to individual heat soak test batches, in order that, in the event of failure, it shall be possible to identify and locate all panels from that heat soaked test batch.
      3) Statistical analysis of partial heat soaking is not acceptable.
      4) Warranties against nickel sulfide inclusions in lieu of heat soaking will not be accepted.
   d. Roller wave distortion: Limit roller wave distortion to 0.003 inches peak to valley.
   e. Wherever possible, locate tong marks along edge which will be concealed in glazing system.
   f. Permanently mark each unit of tempered glass with certification label acceptable to authorities having jurisdiction. Permanent marking is not required for tempered spandrel glass.

g. Locations: Provide as indicated and as required to comply with referenced standards.

3. Heat-strengthened glass:
   a. ASTM C1048, Kind HS, of color and type indicated.
   b. Locations: Provide as indicated, as required to comply with referenced standards and as required for conditions of glass application and intended use.

C. Low-Emissivity Coated Glass:
1. ASTM C1376, coated by pyrolytic process or vacuum deposition (sputter-coating) process, and complying with other requirements specified.
2. Do not apply coatings until after glass has been heat-treated.
3. Properties: See "Insulating Glass" below.
4. Acceptable product and manufacturer: See "Insulating Glass" below.

D. Ceramic-Coated Vision (Fritted) Glass:
1. ASTM C1048, Kind FT, Condition C, Type 1, Class 1, Quality q^3; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.
2. Ceramic frit color: To be selected from manufacturer's standard color range.
3. Pattern: Holes pattern with 60% coverage.
4. Acceptable product and manufacturer: Equivalent to the following by Viracon:
   a. Simulated Sand Blast V-1086.

E. Fire-Rated Glazing:
1. Fire-resistive glazing: Clear fire-rated and impact safety-rated laminated or insulating glass units, consisting of multiple lites of clear float glass and transparent intumescent interlayer; assembled thickness as required to achieve specified fire rating
   a. Provide products complying with the following:
      1) Passed hose stream test portion of referenced fire resistance tests (withstands thermal shock).
      2) Complies with 450 deg F (250 deg C) temperature rise limitation.
      3) Product certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
   b. Fire rating: 45 and 90 minutes**.**
   c. Acceptable products and manufacturers:
      1) Pilkington Pyrostop 45-200 and 90-102 by Technical Glass Products.
      2) SuperLite II-XL 45 and 90 by Safti First, division of O'Keefe's.
      3) Pyrobel-45 and Pyrobel-90 by AGC Flat Glass Europe, distributed by AGC InterEdge Technologies LLC.
      4) SGG Swissflam 45 and SGG Contraflam 90/SGG Swissflam 90 by Vetrotech Saint-Gobain.

F. Mirror Glass:
1. ASTM C1503, Mirror Select Quality; with silvering, electro-plated copper coating, and protective organic coating.
2. Minimum thickness: 6 mm.
3. For mirrors in athletic areas (other than mirrors over countertops), shop-apply impact-resistant film adhered to entire back surface of mirrors.

a. White polyester scrim-reinforced film, 4 mil thick, with pressure-sensitive acrylic adhesive, specifically designed as safety backing for mirrors. Application of film to mirrors shall provide compliance with CPSC 16CFR, Part 1201 for Category II materials.
b. Provide in widths as required for a single sheet of film to cover full extent of each mirror.
c. Provide with additional adhesives as recommended by film manufacturer.
d. Acceptable product and manufacturer: Equivalent to No. 2MT, Category Two Mirror Safety Backing by C.R. Laurence Company, Inc.
e.
f.
g.

G. Laminated Glass Units (LGU):
1. Locations:
a. Provide laminated glass at interior window areas up to 18 inches above finished floor and as required by code.
b. Provide laminated glass at interior glazing for classrooms, labs and learning spaces.
2. Provide laminated glass units certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
3. Provide laminated glass complying with requirements of ASTM C1172.
4. Provide physical attack-resistant glass complying with requirements of UL 972 5-aa1 rated for 6 minutes, for all exterior glass in ground-level or otherwise accessible locations.
a. Basis-of-Design product and manufacturer: Equivalent to SG4 School Guard Glass by LTI Smart Glass, Inc.
5. Interlayer for typical laminated units:
a. Polyvinyl butyral plastic (PVB) sheet, unless otherwise required to produce a successful lamination.
b. Ionomeric-extruded polymer.
1) Thickness: 0.06 inches thick.
2) Color: Clear.
3) Interlayer shall be recommended by manufacturer for weather exposure at exposed edges of laminated glass units, and shall be compatible with silicone glazing sealants without deterioration.
c. Colors, patterns: Provide as scheduled.
6. Fabrication:
a. Laminate units at factory using manufacturer's standard heat-plus-pressure process.
b. Exclude dirt and other foreign materials from lamination.
c. Eliminate voids and delaminated surfaces from Work.
d. Cut units to proper size at factory. Do not cut laminated glass at Project site.
e. Cut and treat edges in accordance with glass manufacturer's recommendations.
f. Arrange each course of laminate in order specified and label exterior (or interior) face of each completed unit.
g. For laminated glass units with exposed edges, fabricate so that each layer of glass, and each interlayer, is flush at unit edges.
7. LGU schedule:
a. LGU-1: 3mm (1/8”) clear tempered glass, clear PVB interlayer, 3 mm (1/8”) clear tempered glass. Total thickness about 6 mm (1/4”).

b. LGU 2: same as LGU-1 but with translucent interlayer selected by Architect from manufacturer's standard selections.
c. LGU-3: same as LGU-1 but with opaque interlayer selected by Architect from manufacturer's standard selections.
d. LGU-4: same as LGU-1, but with physical attack-resistant PVB interlayer complying with requirements of UL 972 5-aa1. Basis of Design: Equivalent to SG4 School Guard Glass by LTI Smart Glass, Inc.
e. LGU-5: 6mm (1/4") clear tempered glass, clear PVB interlayer, 6 mm (1/4") clear tempered glass. Total thickness about 12 mm (1/2").
   1) STC rating: 35
   2) Locations: Required at all interior classrooms and learning areas, where called for in IGU schedule, and as noted on the drawings.
   3)
   4)

H. Insulating Glass Units (IGU):
1. Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified.
2. Fabricate units at factory with hermetic seals at edges with both primary and secondary elastomeric seals.
3. Make primary seals of polyisobutylene and secondary seals of neutral cure, 2-part silicone manufactured specifically for use in insulating glass units, unless otherwise recommended by manufacturer to fulfill performance criteria.
4. Spacer:
   a. Rolled laser welded aluminum tube with soldered, brazed, welded or uncut bent corners.
   b. Size: Not less than 3/4 inch smaller or more than 1 inch smaller than glass lights, centered to show equal margins top, bottom and both sides.
   c. Finish and color: match color of glazing frame.
   d. Fill void between spacer and glass edges completely with silicone secondary seal, devoid of trapped air bubbles.
5. Flatness tolerance: Manufacture units so that maximum out-of-plane concavity/convexity, at center of each lite, does not exceed the following when ambient temperature is 70 deg F and glass surface temperature is within +/-5 deg F of ambient temperature. Measure flatness with units in installed vertical position.
   a. Units 20 square feet and larger in area: +/-1/16 inch maximum.
   b. Units smaller than 20 square feet in area: +/-1/32 inch maximum.
   c. If units are manufactured at a geodetic elevation higher or lower than that of the Project, take measures to assure that flatness tolerances are met. If filling or deflating is used at time of manufacture to compensate for elevation difference, it shall be done after full curing of glass edge seals.
6. IGU schedule:
   a. IGU-1: Outer light (6mm (1/4") clear tempered glass with low emissivity coating on #2 surface); 12mm (1/2") argon gas filled space; Inner Light (LGU-1)
   b. IGU-2: Same as IGU-1 but with LGU-2 interlayer
   c. IGU-3: Same as IGU-1 but with LGU-3 interlayer
   d. IGU-4: Same as IGU-1 but with LGU-4 interlayer. Required at all ground level window wall assemblies up to a height of at least 8 ft. or first horizontal mullion above 8 ft.

1) Acceptable product and manufacturer: Equivalent to School Guard Glass SG4 with SNX 62/27 by Guardian.

2.2 GLAZING MATERIALS

A. General:
1. Comply with manufacturer's recommendation for selection of hardness, depending on location of application, conditions at time of installation and performance requirements indicated.
2. Provide materials, and variations or modifications that are compatible with surfaces contacted in installation.
3. Color: Provide colors selected by Architect from manufacturer's standard colors.

B. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Silicone Glazing (Weatherseal) Sealant:
1. Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920, Type M or S, Grade NS, Class 50.
2. Sealant shall have a current validation certificate from the Sealant, Waterproofing and Restoration Institute (SWRI).
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Acceptable products and manufacturers:
   a. 795 by Dow Corning Corp.
   b. SilPruf SCS2000 by Momentive Performance Materials, Inc.
   c. 864 by Pecora.
   d. Spectrem 3 by Tremco.

D. Structural Silicone Glazing Sealant:
1. Chemically curing silicone formulation complying with ASTM C1184, that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural sealant manufacturer for use in assemblies indicated.
2. Sealant shall have a current validation certificate from the Sealant, Waterproofing and Restoration Institute (SWRI).
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Acceptable products and manufacturers:
   a. 995 by Dow Corning Corp.
   b. Ultraglaze SSG 4000 by Momentive Performance Materials, Inc.
   c. 895 by Pecora.
   d. Spectrem 2 by Tremco.

E. Glazing Sealant for Fire-Resistant Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

F. Acrylic-Emulsion Glazing Sealant: Emulsion of acrylic, with or without latex rubber modification; compounded specifically for glazing; nonhardening, nonstaining and nonbleeding.

G. Butyl Rubber Glazing Tape:

1. Partly-vulcanized, self-adhesive, non-staining, elastomeric tape, 100% solids; complying with AAMA 800.
2. Provide with or without spacer rod, as recommended by tape and glass manufacturers to suit applications indicated.

H. Polyurethane Foam Glazing Tape:
1. High-density, closed-cell, flexible, non-extruding tape, adhesive backed one side only; recommended by manufacturer for exterior applications with nominal pressure in glazing channel.
2. Acceptable manufacturer: Norton Company.
3. Acceptable products: As recommended by manufacturer suitable for conditions of application and use.
4. Acceptable product and manufacturer - structural sealant glazing systems: Thermalbond V-2100 by TBP Converting

I. Molded Resilient Neoprene Gaskets: Continuous extruded neoprene gaskets complying with applicable ASTM standards for physical properties including durometer hardness and tensile strength recommended by framing manufacturer and tested to demonstrate conformance with Contract Documents.

J. Glazing Felt: Treated wool felt, adhesive backed, non-wicking and non-staining.

K. Mirror Mastic:
1. Adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed
2. Acceptable manufacturers:
   a. Royal Adhesives.
   b. Palmer Products Corp.

L. Glazing Accessories:
1. Provide materials with proven record of compatibility with surfaces and other materials contacted in installation.
2. Setting blocks: Neoprene or silicone, 70-90 Shore A durometer hardness.
3. Spacers: Neoprene or silicone, 40-50 Shore A durometer hardness, adhesive backed one face only.
4. Corner blocks: Closed cell neoprene wedge blocks designed to prevent lateral displacement of glass, as recommended by manufacturer and GANA Glazing Manual.
5. Cleaners, primers, and sealers: As recommended by sealant or gasket manufacturer.

2.3 ACCESSORIES

A. Mirror Edge Trim: Extruded aluminum J-channels formed with a return deep enough to produce a glazing channel to accommodate mirrored glass units of thickness indicated and in lengths required to cover bottom edge of each mirrored glass unit in a single piece; clear stain anodized finish.
1. Bottom trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm)
2. Top trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).

2.4 FABRICATION

A. Cutting:
1. Obtain sizes from Shop Drawings or by field measurement.
2. Cut glass to fit openings with minimum edge clearances and bite on glass recommended by glass manufacturer. Do not nip glass edges.
3. Factory cut heavy heat absorbing glass (over 10 mm) and heavy float glass (over 13 mm).
4. Edges:
   a. Concealed: Wheel cut or sawed and seamed.
   b. Exposed: Square edge; ground smooth and polished.
5. Mirrors:
   a. Seal edges after treatment to prevent chemical or atmospheric penetration of glass coating.
   b. Perform edge treatment and sealing in shop immediately after cutting to final sizes.
6. If glass will be cut in field, fabricate glass 2 inches larger than required.
7. Provide required openings in tempered or heat-strengthened glass before heat-treating. Do not cut, seam, nip or abrade such glass after heat-treating.
8. When glass is pre-cut to sizes obtained from Shop Drawings, take field measurements of openings before glazing to verify adequate bite of glass and minimum edge clearance.
9. If openings do not comply with tolerances for which pre-cut glass was sized, use new glass specially cut to fit such openings.

B. Fire Department Labels:
1. Provide permanent labels as indicated on Drawings and as required to comply with requirements of authorities having jurisdiction over Work.
2. Prior to tempering, etch or sandblast label on #2 surface of insulating unit, unless otherwise required to fulfill performance criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, including framing and glazing channels, and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

B. Ensure that frame openings are plumb, level, true to line and otherwise properly installed.

C. Inspect each piece of glass immediately before installation, and discard pieces which evidence damage or deterioration including edge damage or face imperfections.

3.2 PREPARATION

A. Clean glazing channel and other framing members to receive glass immediately before glazing.

B. Remove coatings not firmly bonded to substrate. Remove lacquer from metal surfaces abutting elastomeric sealants.

C. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.

3.3 INSTALLATION

A. Comply with combined recommendations of referenced standards, glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are indicated or specified, and except where manufacturer's technical representatives direct otherwise.

B. Layout:
   1. Unify appearance of each series of lites by setting each piece to match others as nearly as possible.
   2. Inspect each piece and set with pattern, draw and bow oriented in same direction as other pieces.

C. Setting Blocks:
   1. Install setting blocks at sill one-quarter in from each end of the glass, unless otherwise recommended by manufacturer.
   2. Use blocks of proper size to support glass.

D. Spacers:
   1. Provide spacers for glass sizes larger than 50 united inches to separate glass from stops except where continuous glazing gaskets or felts are provided.
   2. Locate spacers no farther than 24 inches apart and no closer than 12 inches to corners.
   3. Place spacers opposite one another. Make bite of spacer on glass a nominal 1/4 inch or greater.

E. End Blocks: Provide end blocks to comply with requirements of referenced glazing standards except where otherwise required by glass manufacturer.

F. Backer Rods: Install compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers.

G. Sealant Glazing:
   1. Force sealants into channel to eliminate voids and to ensure complete “wetting” or bond of sealant to glass and channel surfaces.
   2. Use masking tape to limit coverage of glazing materials to surfaces intended for sealants.
   3. Cure sealants for high early strength and durability.
   4. Tool exposed surfaces of glazing materials to provide slight wash away from glass.

H. Gasket Glazing:
   1. Vulcanize joints of glazing gaskets in accordance with manufacturer's instructions to provide continuous watertight and airtight seal at corners and other locations where joints are required.
   2. Butt or lap ends of tape.
   3. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not “walk” out when subjected to movement.
   4. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead. Set gaskets in silicone sealant at corners.
   5. Install exposed tapes or gaskets with slight protrusion above stops in final compressed condition.

I. Insulating Glass:
   1. Set insulating units with void between edge of units and glazing channel except in cases where a heel bead is required to prevent water leakage.
   2. Conceal edge spacer and seal binding of units with glazing material.

J. Fire-Resistant Glazing Products: Install in labeled fire doors, frames and windows to meet requirements of cited references and NFPA Standard No. 80.

K. Mirror Adhesive Installation:
   1. Paint back of mirror with additional coat of moisture-resistant paint of type recommended by mirror manufacturer.
   2. Support mirror on setting blocks or continuous glazing gasket.
   3. Seal porous substrates as recommended by mastic manufacturer.
   4. Apply mirror mastic in spots in accordance with mastic manufacturer's instructions, and to allow air circulation between back of mirror and face of mounting surface.

3.4 CLEANING

A. Clean excess sealant or compound from glass and framing members immediately after application.

B. After installation and until final acceptance, clean glass as frequently as required, but not less than once per month, to remove build-up of dirt, scum, and other substances. Comply with glass manufacturer's recommendations for cleaning.

C. Wash and polish glass on both faces not more than 4 days prior to final acceptance.

D. Comply with glass manufacturer's recommendations for final cleaning.

3.5 PROTECTION

A. Protect glass from breakage after installation. Do not apply markers to surfaces of glass.

B. Remove non-permanent labels.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Acoustical panels for lay-in application.
   2. Metal framing and suspension systems.
   3. Trim and accessories.

B. Products Furnished but Not Installed Under This Section: Furnish inserts and anchors to other trades well in advance of time needed for coordination with other Work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 21 for sprinkler heads.

B. See Division 23 for mechanical grilles and diffusers.

C. See Division 26 for light fixtures, fire and smoke detectors and speakers.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each component.

B. Shop Drawings:
   1. Submit project-specific Shop Drawings, drawn to scale, showing details and reflected ceiling plans.
   2. Show location of items of Work requiring coordination with acoustical ceilings or supported by acoustical ceiling systems.

C. Samples:
   1. Panels: Submit 12 inch x 12 inch (30 mm x 300 mm) samples of each type.
   2. Exposed framing members and moldings: Submit 12 inch (300 mm) lengths of each type, color and finish.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit installer qualifications verifying years of experience; include list of projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finished ceilings to include in maintenance manuals.

1.6 SYSTEM REQUIREMENTS

A. Interface with Other Systems: Coordinate layout and installation of acoustical ceiling units, suspension system components and accessories with other Work supported by, or penetrating through, ceilings, including but not limited to light fixtures, fire and smoke detection system components, HVAC equipment, fire-suppression system components and partition system.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

1.8 SAMPLE INSTALLATIONS

A. Prior to commencing Work and preceding pre-installation conference, provide sample installations for suspended acoustical ceiling Work.

B. Size: Minimum 10 feet square (3000 mm) in areas acceptable to Architect.

C. Materials: Complete installations with materials in systems, including panels, suspension system, wall moldings, light fixtures and mechanical grilles and diffusers.

D. Architect's Review:
   1. Architect will review sample installations for visual acceptance of materials and workmanship.
   2. Obtain Architect's approval of sample installations before proceeding with subsequent Work.

E. Maintain approved sample installations during construction as standard for subsequent Work.

F. Properly finished and maintained sample installations may be incorporated into completed Work.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site to review materials, installation procedures and coordination with other Work.

1.10 SEQUENCING AND SCHEDULING

A. Do not install interior acoustical ceilings until space is enclosed and weatherproof, wetwork in space is completed and nominally dry, and Work above ceilings is complete. Complete above ceiling close-in inspections including verification of conforming MEP rough-in, hangers and penetration sealing using acoustical sealant or firestopping.

1.11 PROJECT CONDITIONS

A. Verify measurements and dimensions at site.

B. Survey space to determine variation of floor slabs from level. Identify high and low points, and coordinate with Architect in field to establish datum for laying out each ceiling area.

C. Environmental Requirements:
1. Permit panels to reach room temperature and stabilized moisture content before installation.
2. Do not install panels until ambient conditions of temperature and humidity in space will be continuously maintained at values near those indicated for final occupancy.
3. Do not install if ambient temperature is less than 60 deg F (15 deg C).

1.12 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in manufacturer's unopened containers, clearly indicating manufacturer's name, brand, type, style, size, color, texture and other identifying information.

B. Store materials in dry location, off ground and in manner to prevent damage or deterioration.

C. Replace materials which have been damaged or are otherwise unfit for use, as directed.

1.13 EXTRA STOCK

A. Deliver one unopened carton of panels for each 100 cartons (or fraction thereof) installed for each type, pattern and color.

B. Store at Project site where directed. Ensure cartons are identified by manufacturer, product, pattern and color.

1.14 WARRANTY

A. Provide written warranty for acoustical celing systems, signed by Contractor, manufacturer and installer, agreeing to repair or replace faulty materials or workmanship for 2 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Manufacturers - Acoustical Panels:
1. Armstrong World Industries.
2. CertainTeed, Inc.
3. USG Interiors, Inc.

2.2 ACOUSTICAL PANELS

A. Type ACT-A:
1. Description: Fiberglass.
2. Classification, per ASTM E1264: Type IV, Form 2, Pattern E.
3. Size: 24 inch x 24 inch x 3/4 inch thick (610 mm x 610 mm x 19 mm thick).
4. Edge profile: Square or tegular edge lay-in, for 15/16 inch wide grid.

5. Finish: Factory applied washable vinyl latex paint.
6. Color: White.
7. Light reflectance: ASTM E1477, LR .90.
8. Flame spread: ASTM E1264, 0-25.
9. Noise-reduction coefficient (NRC): ASTM E1264, 0.95.
10. Ceiling attenuation class (CAC Range): ASTM E1264, 35 minimum.
11. Locations: Administrative, Academic, Cafeteria
12. Acceptable product and manufacturer: Equivalent to OPTIMA by Armstrong.

B. Type ACT-B:
1. Description: Mineral fiber with fine fissure texture.
2. Classification, per ASTM E1264: Type/Form IV, Pattern C.
3. Size:. 24 inch x 24 inch x 5/8 inch thick (610 mm x 1220 mm x 16 mm thick).
4. Edge profile: Square lay-in.
5. Finish: Factory applied washable white paint.
6. Color: White.
7. Light reflectance: ASTM E1477, LR .80.
8. Flame spread: ASTM E1264, 0-25.
9. Noise-reduction coefficient (NRC), ASTM E1264: 0.70
10. Ceiling attenuation class (CAC Range): ASTM E1264, 35 minimum.
11. Locations: Back of House.
12. Acceptable product and manufacturer: Equivalent to Fissured No. 536 by Armstrong.

C. Type ACT-K:
1. Description: Mineral fiber composite.
2. Classification, per ASTM E1264: Type IV, Form 2, Pattern E.
3. Size: 24 inch x 24 inch x 3/4 inch thick (610 mm x 610 mm x 19 mm thick).
4. Edge profile: Square edge lay in, for 15/16 inch wide grid.
5. Finish: Factory applied washable vinyl latex paint.
6. Color: White.
7. Light reflectance: ASTM E1477, LR .80.
8. Flame spread: ASTM E1264, 0 25.
9. Noise reduction coefficient (NRC): ASTM E1264, 0.70.
10. Ceiling attenuation class (CAC Range): ASTM E1264, 35 minimum.
11. Locations: Kitchen, Health Room, Pools
12. Acceptable product and manufacturer: Equivalent to CALLA or ULTIMA by Armstrong.

D. Type ACT-L:
1. Description: Fiberglass.
2. Classification, per ASTM E1264: Type IV, Form 2, Pattern E.
3. Size: Large format tile, size as indicated on Drawings.
4. Edge profile: Square or tegular edge lay in, for 15/16 inch wide grid.
5. Finish: Factory applied washable vinyl latex paint.
6. Color: White.
7. Light reflectance: ASTM E1477, LR .90.
8. Flame spread: ASTM E1264, 0 25.
9. Noise reduction coefficient (NRC): ASTM E1264, 0.95.
10. Ceiling attenuation class (CAC Range): ASTM E1264, 35 minimum.
11. Locations: Large rooms that require large tile or where visual impact is desired.

12. Acceptable product and manufacturer: Equivalent to OPTIMA by Armstrong.

2.3 SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635.

B. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated.
   1. Power-actuated fasteners in concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-coated, carbon-steel wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Nickel-copper-alloy wire (at swimming pool ceilings): ASTM B 164, nickel-copper-alloy UNS No. N04400.
   3. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 inch (2.69 mm) diameter wire.

D. Impact Clips at Gymnasium Ceilings: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

E. Exposed Suspension System:
   1. Description:
      a. ASTM C635, intermediate duty, exposed T with 15/16 inch (24 mm) wide face; interlocking components.
      b. End condition of cross runners: Butt-edge.
   2. Materials: Cold-rolled steel with hot-dipped galvanized coating.
   3. Finish and color: Manufacturer's standard factory finish; white.
   4. Provide corrosion resistant grid at Pools.
   5. Acceptable products and manufacturers:
      a. Prelude XL by Armstrong.
      b. Chicago Metallic 200 Snap Grid 15/16" Exposed by ROCKFON.
      c. USG Donn Brand DX/DXL 15/16" Acoustical Suspension System by USG Interiors.

2.4 ACCESSORIES

A. Trim:
   1. Manufacturer's standard trim and edge moldings to suit suspension system requirements; same finish as suspension system.
   2. Provide edge moldings to fit penetrations exactly, including circular penetrations.
   3. Expansion joints: Provide framing and closure trim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install materials and systems in accordance with final Shop Drawings, manufacturer's instructions and requirements of ASTM C636, and as required to comply with seismic requirements.

B. Install system to support imposed loads with maximum deflection of l/360 of span.

C. Tolerances:
   1. Level completed assembly to tolerance of 1/8 inch in 10 feet (3 mm in 3000 mm).
   2. Variation from plumb of grid members caused by eccentric loads: 2 degrees maximum.

D. Hangers:
   1. Coordinate location of hangers with other Work.
   2. Space not more than 6 inches (150 mm) from each end and not more than 4 feet (1200 mm) on center between ends of members to be supported.
   3. Provide additional hangers for support of fixtures, equipment, and other items supported by ceiling suspension system, in quantity as required to prevent eccentric deflection or rotating of supporting runners.
      a. At each corner of ceiling suspension system around fixtures, equipment, and other items, provide at least 1 hanger for support of ceiling suspension system.
      b. Hangers for fixtures, equipment, and other items shall be provided by trade that provides the fixture, equipment, or item.
   4. Hang system independent of walls, columns, ducts, pipes and conduit.
   5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   6. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   7. Where spacing of structural members, width of ducts, or other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   8. Where ceilings are below steel deck without concrete fill, attach hangers directly to structural elements only; do not attach to steel deck. Loop hangers and wire-tie directly or provide anchors or inserts.

E. Center suspension system on room axis leaving equal border units, unless otherwise indicated on Drawings. Adjust so that perimeter units are not less than one-half of panel width.

F. Edge Molding Installation:
   1. Install edge moldings where ceilings abut walls, partitions or other penetration elements.
   2. Miter cut inside and outside corners to provide flush, tight, hairline joints.
   3. Secure moldings to building construction at 16 inches (400 mm) on center, and maximum 3 inches (75 mm) from each end of each molding.
   4. Do not use exposed fasteners, including pop rivets, on moldings and trim.

G. Panel Installation:
   1. Install panels in place, level, in uniform plane and free from twist, warp and dents.
   2. Rest panel edges resting on flanges of tees.
   3. Support perimeters on wall moldings.
   4. Neatly scribe and cut panels for accurate fit at borders, interruptions, and penetrations by other Work.
   5. Lay directional patterned units one way with pattern parallel to longest room axis, unless otherwise indicated.

3.3 CLEANING AND PROTECTION

A. Clean and repair exposed surfaces that have been stained, marred, or otherwise damaged.

B. Remove and replace Work which cannot be successfully cleaned or repaired.

C. Protect Work so that it will be without damage at time of acceptance.

END OF SECTION

SECTION 09 6466

WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Wood athletic flooring system consisting of maple strip flooring on floating plywood subfloor.
2. Supports, anchorage and attachment systems.
3. Finishing.
4. Playing lines.
5. Accessories.
6. Installation of gym flooring inserts.

1.2 ACTION SUBMITTALS

A. Product Data:
1. Submit manufacturer's specifications and installation instructions for each component of athletic flooring system.
2. Include data on handling, storage and protection for each component.

B. Shop Drawings:
1. Submit detailed project-specific Shop Drawings, drawn to scale, for layout and installation of athletic flooring system, including locations of gym flooring inserts.
2. Include large scale details of jointing provisions, conditions at perimeters and attachment, and expansion provisions and trim details.
3. Include details of associated Work required in conjunction with flooring system, including gym flooring inserts.
4. Include layout, colors, dimensions and details for playing lines.
5. Details of concrete slab depressions.
6. Locations of different grades of wood flooring.

C. Samples:
1. Flooring surfaces:
   a. 24 inch (600 mm) square x full depth finished sample for system, complete with accessories suitably mounted on plywood backing.
   b. Leave edges unfinished so that floor assemblies can be viewed.
2. Playing lines: Submit 12 inch (300 mm) wide x 24 inch (600 mm) long flooring samples finished with playing lines for each required color of lines.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit installer qualifications verifying years of experience and approval of manufacturer; include list of completed projects have similar scope of work identified by name, location, date, reference names and phone numbers.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data:
1. Submit manufacturer's written maintenance instructions which describe materials, devices and procedures to be followed in cleaning and maintaining flooring.
2. Include manufacturer's brochures describing actual materials, finishes and accessories used in Work.
3. Include copy of maintenance instructions in Project maintenance and information manual.
4. Submit manufacturer/installer warranty.
5. Submit pre-installation test/inspection reports documenting substrate testing for moisture content.

1.5 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Drawings indicate design concept, overall sizes and layout of flooring and flooring assemblies and together with these specifications impose requirements applicable to Work.
2. Contractor is responsible for correct thickness of flooring materials, supports, assemblies and attachment details for conditions of support and use to fulfill specified performance requirements.

B. Playing Lines: Comply with Olympic and Pan American requirements for court layouts, playing lines and insert locations for the following sports: badminton, basketball and team volleyball.

C. Interface With Other Systems:
1. Coordinate Work with that of other trades affected by this installation.
2. Provide anchors and supports in timely manner so as not to delay job progress.
3. Coordinate with electrical and other fixtures or materials mounted within, or adjacent to flooring or requiring access.
4. Provide cut-outs as required using manufacturer's templates and field measurements to verify actual installed locations and dimensions.
5. Verify dimensions before proceeding and obtain measurements at job site for Work required to be accurately fitted to other construction. Be responsible for accuracy of such measurements and precise fitting and assembly of finished products.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: System components and accessories shall be as furnished or approved by flooring manufacturer.

B. Reference Standards:
1. Comply with applicable provisions of Maple Flooring Manufacturers Association (MFMA) for species, grade, cut and installation guidelines.
2. Deliver wood to site stamped with MFMA mark.

C. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project, approved by wood flooring manufacturer.

D. Provide manufacturer/installer warranty.

1.7 SAMPLE INSTALLATION

A. Prior to commencing Work and preceding pre-installation conference, provide sample installation of athletic flooring system.

B. Size: Ten feet (3000 mm) square, in location as determined by Architect.

C. Materials: Complete installation with materials in flooring system.

D. Architect's Review:
1. Architect will review sample installation for visual acceptance of materials and workmanship.
2. Obtain Architect's approval of sample installations before proceeding with subsequent Work.

E. Maintain approved sample installation during construction as standard for subsequent Work.

F. Properly finished and maintained sample installation may be incorporated into completed Work.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at Site and review installation procedures and coordination with other Work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Delivery:
1. Deliver flooring in unopened bundles and store in dry place.
2. Do not deliver material to building until wet Work is complete.
3. Do not deliver flooring on a rainy day.

C. Storage:
1. Do not store flooring vertically.
2. Store in protected, cool dry location, out of sunlight in manufacturer's unopened protective shipping packaging.

D. Acclimate materials to building conditions for duration and using methods recommended by flooring manufacturer.

1.10 PROJECT CONDITIONS

A. Environmental Requirements:
1. Comply with manufacturer's instructions.
2. Maintain relative humidity conditions within building that approximate relative humidity conditions which will prevail when building is occupied, for one week proceeding flooring system, during installation, and for at least 24 hours after installation.

3. Maintain ambient air temperature of between 65 deg F (18 deg C) and 80 deg F (27 deg C) for one week proceeding flooring system installation, during installation, and for at least 24 hours after installation and finishing.

B. Substrate Requirements: Do not install flooring system until concrete substrate has cured at least 60 days, and tests an average moisture content of 8%.

1.11 SEQUENCING AND SCHEDULING

A. Prior to commencement of installation, building must be enclosed and dry, with permanent heating and air conditioning systems, and lighting, installed and operating.

B. Do not install flooring system until completion of all of following:
1. Masonry, plastering, tile and other wet Work.
2. Finishing operations, including painting.
3. Overhead Work, including mechanical, electrical and athletic equipment.

C. Coordinate layout and installation of slab depressions to accommodate layout and height of wood athletic flooring assembly.

D. Coordinate layout and installation of flooring with floor inserts for equipment as applicable.

E. Coordinate installation of wood athletic flooring to ensure proper sequencing of the work to allow concrete structural slab to properly dry out so that moisture and vapor are not trapped in concrete slab by subsequent installation of moisture vapor emission control system, wood athletic flooring vapor retarder, and high-performance coatings.

1.12 WARRANTY

A. Provide manufacturer's standard five year warranty for wood flooring.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Manufacturers:
1. Robbins Sports Surfaces, Inc.
2. Connor Sports Flooring.
3. Advantage Sport.
4. Equivalent products by other manufacturers will be considered.

2.2 MATERIALS

A. Plywood Subfloor:
1. Components:
a. Double layer plywood subfloor.
b. Cushioning pads.
c. Vapor barrier.
2. Plywood:

a. Two layers, each 1/2 inch (13 mm) thick, Grade C/D Exterior Grade fir or Southern pine plywood.
b. Fabricate isolator profiles (impact isolator slots) as recommended by flooring manufacturer for load-distribution subfloor; equivalent to TBD Product and Manufacturer.

3. Cushioning pads:
   a. Flooring manufacturer's standard resilient pads; 3/4 inch (19 mm) high.
   b. Acceptable product: Equivalent to Robbins EPDM Bio-Pad by Robbins.
4. Vapor barrier: 6 mil (0.16 mm) polyethylene sheet.
5. Accessories: Provide staples, fasteners, adhesives and other accessories as required for complete installation.

B. Finish Flooring:
1. Wood strip flooring of Northern Hard maple, Second and Better Grade (MFMA), edge-grained .
2. Dimensions: 33/32 inches (27 mm) thick x 2-1/4 inches (58 mm) wide x standard random lengths complying with MFMA First or Second Grade rules.
3. Matching: Reverse profiled tongue-and-grooved and end-matched.
4. Treat flooring with specified wood preservative.

2.3 FINISHES

A. Preservative: Manufacturer’s standard.

B. Wood Flooring Finish: Wood flooring manufacturer's recommended polyurethane sealer and finish.

C. Playing Lines:
1. Description: Flooring system manufacturer's playing line paint, compatible with flooring finish.
2. Colors: To be selected by Architect from manufacturer's full range of standard color selections. Up to 4 colors may be required.

2.4 ACCESSORIES

A. Perimeter Base:
1. Description: Flooring system manufacturer's standard vented rubber base, for use where flooring abuts wall or vertical obstruction.
2. Size: 3 inches (76 mm) wide x 4 inches (102 mm) high with matching premolded outside corners.
3. Color: Black.

B. Perimeter Threshold:
1. Description: Rolled or extruded aluminum threshold/cover plate, for use where flooring abuts doors and other open areas.
2. Size:
   a. 4 inches (102 mm) wide x minimum 1/8 inch (3 mm) thick x maximum available lengths to suit applications.
   b. Fabricate units with beveled or radiused edges.

3. Finish: Smooth finish, with clear PVC coating for rolled units or clear anodized finish for extruded units.
4. Provide with flathead screws and expansion shields suitable for concrete substrates.
5. Acceptable product and manufacturer: 818 (Aluminum**),** by National Guard Products, Inc., Memphis, TN; or equivalent by Pemko, Reese or Zero.

C. Inserts: Coordinate with DCPS for types and quantities of gym flooring inserts required for athletic equipment support, primarily volleyball nets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Test for dryness of concrete substrate by methods recommended by flooring manufacturer.

B. Grind high spots and fill low spots with leveling compound, as approved by flooring manufacturer, so that substrate is level to within tolerance of ±1/4 inch in 10 foot (6 mm in 3000 mm).

C. Penetrations:
1. Install inserts for athletic equipment in accordance with insert manufacturer's directions, in locations directed by Owner and in conformance with Olympic and Pan American requirements.
2. Verify that other sleeves and inserts for items penetrating flooring, such as electrical equipment, are installed and completed before starting athletic flooring system installation.

D. Broom clean substrate.

3.3 INSTALLATION

A. Comply with final Shop Drawings and flooring manufacturer's instructions and recommendations.
1. Provide 2 inch (50 mm) expansion space within flooring system and at walls and other obstructions and terminations of flooring.
2. Sequence and install subfloor, finish flooring, perimeter bases and playing lines in accordance with manufacturer's instructions.

B. Subfloor:
1. Install vapor barrier sheeting over concrete substrate; overlap edges 6 inches minimum.
2. Fasten cushioning pads to lower layer of plywood subfloor, on side opposite isolator profiles. Space pads approximately 12 inches (300 mm) on center in both directions.

3. Install lower layer of plywood subfloor with isolator profiles facing upward. Stagger all joints; allow minimum 1/4 inch (6 mm) between plywood panel sides and ends, and minimum 2 inch expansion void at walls and vertical obstructions.
4. Install upper layer of plywood subfloor diagonally to lower subfloor panels, with isolator profiles facing downward.
   a. Stagger all joints both within upper layer and with joints in lower layer, so that no joints coincide between layers; space adjoining sheets 1/4 inch (6 mm) apart.
   b. Attach upper layer using both adhesive and mechanical fasteners as recommended by flooring manufacturer.

C. Finish Flooring:
1. Machine nail finish flooring with end joints properly driven up.
2. Size joints between flooring strips to allow for intermediate expansion, in accordance with anticipated ambient humidity conditions.
3. Stagger joints in flooring with joints in subfloor.

3.4 FINISHING

A. Sanding:
1. Sand wood flooring surfaces in accordance with finish manufacturer's instructions.
2. Rough sanding: Machine sand flooring using rough grade sandpaper to remove offsets and non-level conditions, ridges, cups and sanding machine marks which would be visually noticeable after finishing.
3. Second sanding: Sand again using medium grade sandpaper.
4. After second sanding, if any holes are noticeable, spot fill using broad knife and repair mixture.
5. Final sanding: Edge and sand floors using fine grade sandpaper. Hand sand edges to blend.

B. Vacuum clean and immediately apply finish.

C. Cover sanded floor with building paper to provide access for application of first finish coats.

D. Finishing:
1. Inspect entire area of floor to insure that surface is acceptable for finishing, completely free from sanding dust and perfectly clean.
2. System:
   a. Provide 4-coat finish system, consisting of 2 coats of sealer and 2 coats of finish.
   b. Apply sealer and finish coats according to manufacturer's instructions, to provide smooth surface free of overlaps and streaks.
   c. Screen back or steel wool, and vacuum or tack clean flooring between each coat, after previous coat has dried.
3. Playing lines:
   a. Apply playing lines after seal coats and before finish coats.
   b. Lay out playing lines as indicated on Drawings, and to comply with referenced standards and manufacturer's recommendations.
   c. Paint playing lines on wood flooring. Provide one or two coats as required for full, opaque coverage. Do not overlay game lines where they cross; stop secondary lines at edges of primary lines.
4. Apply finish coats after playing lines.

5. Allow floor to dry thoroughly. Keep closed to all traffic for at least 72 hours and to heavy traffic for at least one week, after applying second coat of finish.
6. Apply decals as required by Owner.

3.5 BASES

A. Install perimeter base and threshholds only after playing lines are complete.

B. Perimeter Base: Fasten to walls and vertical obstructions using flooring manufacturer's recommended adhesive; do not fasten to wood flooring.

C. Thresholds:
1. Drill thresholds for countersunk flathead screws.
2. Fasten only to concrete floor adjoining wood flooring system; do not fasten to wood flooring.

3.6 PROTECTION

A. Protect completed wood flooring during remainder of construction period with heavy Kraft paper to prevent damage or deterioration.

B. Clean flooring just prior to final inspections. Use materials and procedures recommended by flooring manufacturer.

END OF SECTION

SECTION 09 6500

RESILIENT FLOORING AND BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Luxury vinyl tile.
   2. Studded rubber tile.
   3. Solid vinyl sheet.
   4. Resilient base.
   5. Rubber stair risers, stringers, landing tile, and treads.
   6. Reducer strips.
   7. Setting materials and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each material.

B. Shop Drawings: If resilient flooring incorporates a graphic design, submit Shop Drawings, drawn to scale, of areas to receive resilient flooring, showing locations and colors of heat-welded seams.
   1. Submit templates for cut-in designs and patterns in flooring.

C. Samples:
   1. Manufacturer's samples: Submit manufacturer's full range of standard pattern and color samples for each product for Architect's selection.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: Submit manufacturer's certification attesting that resilient materials have been tested by an independent laboratory and comply with required fire resistance ratings.

B. Qualification Data:
   1. Submit installer qualifications verifying years of experience and manufacturer's acceptance; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

C. Submit pre-installation test/inspection reports documenting substrate testing for moisture content adhesion and alkalinity.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit manufacturer's written maintenance instructions for resilient materials.

2. Include copy of submittal in Project information manual.

1.5 SYSTEM REQUIREMENTS

A. Fire Resistance Ratings:
1. Provide resilient materials which comply with following requirements determined by independent testing laboratory acceptable to authorities having jurisdiction.
2. Critical radiant flux: 0.45 watts/cm2 or more when tested in accordance with ASTM E648.
3. Flame spread: 75 or less when tested in accordance with ASTM E84.
4. Smoke obscuration: 450 or less when tested in accordance with ASTM E662.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
1. Not less than 5 years documented, successful experience with work comparable to Work of this Project, approved by manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer's unopened containers clearly marked with manufacturer's name, brand, size, thickness, grade, color and design.

B. Store materials in accordance with manufacturer's instructions.
1. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:
1. Maintain minimum temperature of 65 deg F (18 deg C) in spaces to receive materials for at least 48 hours prior to installation, during installation and for not less than 48 hours after installation.
2. Store materials in spaces where they will be installed for at least 48 hours before beginning installation.
3. After installation, maintain minimum temperature of 55 deg F (13 deg C) in areas where Work is completed.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site to review materials, installation procedures and coordination with other Work.

1.10 SEQUENCING AND SCHEDULING

A. Install resilient materials after other finishing operations, including painting, have been completed.

B. Do not install resilient materials over concrete slabs until they are cured and are sufficiently dry to achieve bond with adhesive as determined by resilient material manufacturer's recommended bond and moisture tests.

1.11 WARRANTY

A. Provide Manufacturer/Installer warranty. Manufacturer's standard form in which manufacturer agrees to repair or replace resilient flooring that fails in materials or workmanship within specified warranty period.
   a. Warranty Period: 10 years from date of Substantial Completion.

1.12 EXTRA STOCK

A. Deliver one unopened box of resilient materials for each 100 boxes (or fraction thereof) installed of each type, pattern and color.

B. Store at job site where directed.

C. Ensure boxes are identified by manufacturer, pattern and color.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Manufacturers – Luxury Vinyl Tile:
   1. Armstrong.
   2. Karndean Designflooring.
   3. Porcelanosa.

B. Acceptable Products and Manufacturers - Solid Vinyl Sheet:
   1. Medintech by Armstrong Commercial Flooring.
   2. Mipolam PVC Series by Mipolam Division, Dynamit Noble of America, Inc. Gerflor
   3. Optima and Mutiflor by Tarkett Inc.

C. Acceptable Manufacturers - Resilient Base:
   1. BurkeMercer Flooring Products.
   2. Flexco.
   3. Johnsonite.
   4. Roppe Corp.

D. Acceptable Products and Manufacturers - Reducer Strips:
   1. BurkeMercer
   2. Flexco.
   3. Johnsonite.
   4. Roppe Corp.

E. Acceptable Manufacturers - Rubber Stair Components:
   1. BurkeMercer Flooring Products.
   2. Flexco.

3. Johnsonite.
4. Roppe Corp.

2.2 FLOORING

A. Luxury Vinyl Tile:
1. Size: 12 inch x 12 inch x 1/8 thick (305 mm x 305 mm x 3 mm thick) unless otherwise indicated.
2. Colors: To be selected by Architect from manufacturer's full range of standard colors.

B. Rubber Tile:
1. ASTM F1344, Class I-A.
2. Size: As indicated.
3. Surface pattern: As scheduled.
4. Colors: To be selected by Architect from manufacturer's full range of standard colors.
5. Acceptable manufacturers:
   a. Nora Flooring
   b. Mondo Flooring.
   c. Burke Flooring.

C. Solid Vinyl Sheet:
1. Description: Non-layered, non-backed, solid vinyl sheet with homogeneous composition and pattern from face to back.
2. Form: Minimum 6 foot (1829 mm) wide rolls, lengths as required to accommodate required installation with minimum seaming.
3. Thickness: 0.080 inch (2 mm) minimum overall thickness.
4. Static load limit: 125 psi (862 kPa) minimum.
5. Colors: Selected by Architect from manufacturer's full range of standard colors.

D. Resilient Base:
1. Description: ASTM F1861.
   a. Type: TP (rubber, thermoplastic)
   b. Group: 1 (solid, homogeneous).
   c. Style: Style A (straight, toe-less) for carpet areas; Style B (cove) for other areas.
2. Height: 4 inches unless otherwise scheduled.
3. Thickness: 0.125 inch (3 mm).
4. Furnish base in continuous coils. Individual lengths are not acceptable.
5. Colors: As scheduled.

E. Rubber Stair Components:
1. Provide stair components from a single manufacturer.
2. Treads:
   a. Description: ASTM F2169.
      1) Material; Type: TS (rubber, vulcanized thermoset).
      2) Surface design: Class 2, Pattern: Raised-disc design.
      3) Manufacturing method: Group 2, tread with contrasting color for the visually impaired.
   b. Nosing style: Square, adjustable to cover angles between 60 and 90 degrees. Square.
   c. Thickness: 1/4 inch (6 mm) and tapered to back edge.

d. Size: Lengths and depths to fit each stair tread in one piece.
e. Colors: As scheduled.

3. Risers:
   a. Style: Full width and height of riser , toeless, height and length to cover risers.
   b. Thickness: 1/8 inch (3 mm).
   c. Surface pattern: Smooth.
   d. Colors: Match treads.
4. Stringers:
   a. Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers.
   b. Colors: Match treads.
5. Landing tile:
   a. Size: Manufacturer's standard.
   b. Surface pattern: Raised circular or radial design, high profile.
   c. Thickness: 1/8 inch (3 mm), minimum.
   d. Colors: Match treads.

F. Reducer Strips:
   1. Description: 1 inch (25 mm) wide (minimum) x thickness as required to abut flush to resilient tile, homogeneous vinyl or rubber composition, tapered or bullnose edge.
   2. Colors: To be selected by Architect from manufacturer's full range of standard colors.

2.3 ACCESSORIES

A. Leveling and Patching Compounds: Latex-modified, portland cement-based or blended hydraulic-cement-based formulation provided or approved by resilient flooring manufacturer for applications indicated.

B. Primers and Adhesives:
   1. Water-resistant products as recommended by manufacturer to suit resilient flooring and substrate conditions indicated.
   2. VOC limits: Provide cements with VOC content not more than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

C. Detergents and Polish: Types recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient flooring manufacturer's written instructions to ensure adhesion of resilient flooring.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and adhesion testing: Perform tests recommended by resilient flooring manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture testing: Perform tests recommended by resilient flooring manufacturer and as follows. Proceed with installation only after substrates pass testing.
   a. Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate, within tolerance of 1/4 inch in 10'-0" (6 mm in 3000 mm).

D. Do not install resilient flooring until materials are same temperature as space where they are to be installed.
   1. Move resilient flooring products and installation materials into spaces where they will be installed at least 72 hours in advance of installation.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient flooring products.

3.3 INSTALLATION

A. Install resilient materials in accordance with manufacturer's instructions.
   1. Apply adhesive to provide continuous bond between resilient material and substrate. Do not allow adhesive to bleed through joints.
   2. Cut units to length; provide straight and tight butt joints.
   3. Fit materials tightly so each unit is in contact with surrounding units and joints in proper alignment.
   4. Scribe, cut, and fit exposed edges of units which adjoin other Work and neatly abut with tight joint.

B. Resilient and Rubber Tile::
   1. Lay tile symmetrically about center line of room or space in a square pattern, unless otherwise indicated. Adjust so that perimeter units are not less than one-half of tile width.
   2. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged.
   3. Lay tile units with bottom surface securely bonded to substrate and top surface left smooth, clean and free of imperfections.
   4. Lay tile with graining running in one direction as directed by Architect.
   5. Align joints as indicated.
   6. Install resilient tile in recessed covers, such as access doors and cleanouts.

7. Extend resilient tile into closets and offsets, and under movable equipment, in rooms and spaces indicated to receive resilient tile, including recessed covers within those spaces. Extend unexposed edges of flooring under set-on bases and similar trim Work.
8. Where resilient tile flooring meets thin-set ceramic tile or other similar hard surface flooring of higher elevation, install underlayment compound such that surfaces of both flooring materials are at same elevation.

C. Resilient Sheet Flooring Installation:
1. Install resilient sheet in accordance with manufacturer's instructions.
2. Lay sheet flooring to provide as few seams as possible, matching edges for color shading and pattern at seams.
3. Adhesives:
   a. Adhere using conventional full spread adhesive method.
   b. Use conventional perimeter bonding adhesive procedures where recommended by flooring manufacturer.
   c. Tightly cement flooring to subfloor without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks.
   d. Hand roll flooring at perimeter and seams to assure adhesion.
   e. Roll in accordance with flooring manufacturer's directions.
4. Prepare seams in accordance with manufacturer's instructions for most inconspicuous appearance.
5. Scribe, cut and fit exposed edges of flooring which adjoins other Work and neatly abut with tight joint.
6. Extend flooring into closets and offsets and under movable equipment of rooms and spaces shown or scheduled to receive resilient flooring, including recessed covers within those spaces. Extend unexposed edges of flooring under set-on bases and similar trim Work.

D. Resilient Base Installation:
1. Install in accordance with manufacturer's instructions.
   a. Do not stretch base during installation.
   b. Roll base firmly in place immediately after applying adhesive.
2. At cove base corners, use corner grooving tool with sharp blades to cut groove in back of resilient base. Bending of cove base around corners without grooving back is not acceptable.
3. Align tops of adjacent sections.
4. Do not allow adhesive to ooze onto wall above base.

E. Stair Components:
1. Landing tile:
   a. Lay landing tiles symmetrically about center line of space in square pattern.
   b. Align joints in both directions.
   c. Terminate landing tile at centerline of door openings where adjacent floor finish is dissimilar.
   d. Finish exposed edge with matching reducer strip.
2. Stair treads and risers**:**
   a. Provide continuous lengths and widths; no joints will be permitted.
   b. Set nosing firmly against step; fill gap between stair riser and nosing of tread with epoxy nosing compound.

3. Stair stringers: Use longest lengths possible; pieces less than 24 inches (600 mm) long will not be permitted.

F. Reducer Strip:
1. Provide at unprotected or exposed edges of tile, unless otherwise indicated.
2. Center strip under door where flooring terminates at door openings.
3. Install in longest lengths practicable.
4. Fit joints tightly, scribe to adjacent surfaces.

3.4 CLEANING

A. Immediately remove excess adhesive from surfaces.

B. Sweep or vacuum thoroughly.

C. Do not wash or scrub flooring for at least five days after installation, to prevent excess moisture from interfering with adhesive bond and/or seam treatments.

D. After adhesive and/or seams have set up, clean flooring by damp-mopping with very dilute neutral detergent solution in accordance with flooring manufacturer's instructions.

E. Near completion of Project and just prior to final acceptance, clean flooring once again.
1. Follow flooring and polish manufacturers' instructions.

3.5 PROTECTION

A. Prohibit traffic on floor finish for minimum of 48 hours after installation.

B. Protect Work from damage during construction period so that it will be without any indication of use or damage at time of acceptance.

END OF SECTION

SECTION 09 6723

RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Epoxy resin flooring system.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 03 3000 CAST-IN-PLACE CONCRETE for concrete slab curing and finishing requirements.

B. See Division 22 for pipe penetrations and floor drains.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for resinous flooring system.

B. Samples:
   1. Submit manufacturer's full range of standard color samples of finish coating for selection by Architect.
   2. Following selection, submit 12 inch (300 mm) square samples of complete system, prepared on plywood or hardboard, for each color selected.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit installer qualifications verifying years of experience and current approval of manufacturer; include list of completed projects have similar scope of work identified by name, location, date, reference names and phone numbers.

B. Certificates: Submit joint certification signed by resinous flooring manufacturer and concrete curing agent manufacturer stating that concrete curing agent is compatible with flooring system and that it will not interfere with flooring system adhesion.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit cleaning and maintenance data for materials provided.
   2. Include copy of submittal in Project information manual.

B. Provide Manufacturer/Installer warranty.

C. Submit pre-installation test/inspection reports documenting substrate testing for moisture content adhesion and alkalinity.

1.6 SYSTEM REQUIREMENTS

A. Physical Performance Requirements: Final installed flooring system, including primer and sealers, shall comply with ASTM C722, Type A standard**.**

B. Flooring system components shall be water-based and contain no hydrocarbon solvents.
   1. Flash point (unmixed material): Not combustible.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project, approved by resinous flooring manufacturer. Such approval shall be current as of the date of bid of this Project.

B. Obtain resinous flooring materials, including fillers, primers, reinforcing membrane, body coats, and top coats from a single manufacturer and use only materials approved by the resinous flooring manufacturer for the required applications.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at Site and review installation procedures and coordination with other Work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Store in protected, cool dry location, out of sunlight in manufacturer's unopened protective shipping packaging.

C. Maintain temperatures of between 70 deg F (21 deg C) and 80 deg F (27 deg C).

1.10 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Comply with manufacturer's instructions.
   2. Ambient air temperature shall be between 70 deg F (21 deg C) and 80 deg F (27 deg C) during and for at least 24 hours after flooring installation.
   3. Do not use water or steam in vicinity of resinous floor application.

B. Close spaces to traffic during resinous flooring application, and for not less than 24 hours after application unless manufacturer recommends a longer period.

1.11 WARRANTY

A. Provide manufacturer's standard form in which manufacturer agrees to repair or replace resilient flooring that fails in materials or workmanship within specified warranty period.

B. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Manufacturers:
1. Stonhard Inc.
2. Crossfield Products Corp.
3. Dudick, Inc.
4. Equivalent products by other manufacturers will be considered.
5.

2.2 MATERIALS

A. Resinous Flooring:
1. Description: Resinous flooring system consisting of primer, trowel-applied body coats including epoxy resin, hardener, aggregates and colorants, and sealing or finish coats.
2. Total system thickness: 1/4 inch (6 mm).
3. Physical properties of cured flooring system:
   a. Compressive strength: Minimum 10,000 psi (169 Mpa) at 7 days, when tested in accordance with ASTM C579.
   b. Tensile strength: Minimum 1750 psi (12 MPa), when tested in accordance with ASTM C307.
   c. Flexural strength: Minimum 4000 psi (27.6 MPa), when tested in accordance with ASTM C580.
   d. Hardness: 85 - 90 Shore D, when tested in accordance with ASTM D2240.
   e. Bond strength: More than 400 psi (2.8MPa), 100% concrete failure, when tested in accordance with ASTM D4541.
   f. Water absorption: Maximum 0.2%, when tested in accordance with ASTM C413.
   g. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
4. Chemical resistance: Cured flooring system shall show no effect from occasional spills of the following reagents.
   a. Organic solvents such as acetone, methanol, and alcohols.
   b. Acids: Hydrochloric, nitric, sulfuric.
5. Color and pattern: As selected by Architect from manufacturer’s full range of colors and patterns.
6. Wear surface: Textured for slip-resistance.

B. Components:
1. Primer: Resinous flooring manufacturer's recommended epoxy primer, for concrete and concrete masonry.
2. Flexible membrane: Resinous flooring manufacturer's flexible epoxy membrane, for use as crack suppression and embedding reinforcing membrane.
3. Reinforcing membrane: Fiberglass scrim and other materials recommended by resinous flooring manufacturer for crack suppression and treatment of floor/base intersections.
4. Aggregates: Manufacturer's standard graded aggregate.
5. Sealing and finishing coats: Epoxy, 100% solids.

C. Patching and Fill Material: Resinous mortar underlayment product acceptable to resinous flooring manufacturer for the application.

D. Joint Sealants: Flexible, non-rigid sealant of type acceptable to resinous flooring manufacturer for type of service and joint conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

B. Verify the following substrate conditions before application of primer and waterproofing:
   1. That substrate condition is satisfactory and in accordance with manufacturer's instructions.
   2. That concrete surfaces are smooth, free of voids, spalled areas, loose aggregate, and sharp protrusions, and with no form match lines or coarse aggregate visible.
   3. That concrete is fully cured (minimum 28 days) and dry.
   4. That detrimental membrane-curing compound containing oil, wax or pigment has not been used on concrete.

3.2 PREPARATION

A. Prepare and clean substrate according to resinous flooring manufacturer’s written instructions. Provide clean, dry, and chemically neutral substrate for resinous flooring application.

B. Protect adjacent surfaces not designated to receive resinous flooring.

C. Substrate Preparation:
   1. Vacuum blast or shotblast surfaces to remove laitance and contaminants.
   2. Fill holes and depressions in substrate using patching and fill material.
   3. Treat cold joints, control joints, and non-moving substrate cracks to prevent joints and cracks from telegraphing through resinous flooring.
   4. Verify that elements penetrating through slab are secured against movement.

D. Verify that moisture content of slab is within range acceptable to flooring manufacturer, using a calcium chloride test kit in accordance with ASTM F1869.
   1. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lbs of water/1000 sq. ft. (0.015 kg/square meter) in 24 hours.
   2. Perform plastic sheet test in accordance with ASTM D4263. Proceed with application only after testing indicates absence of moisture in substrates.
   3. Perform additional moisture tests as may be recommended by manufacturer. Proceed with application only after substrates pass testing.

E. Verify that concrete substrates have neutral pH and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

3.3 APPLICATION

A. Apply and cure resinous flooring system components in accordance with manufacturer's instructions, to provide uniform, monolithic wearing surface.

B. Mix and prepare materials used in resinous flooring system in accordance with manufacturer's installation procedures and coverage rates.

C. Primer:
   1. Apply primer over prepared substrates.
   2. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.
   3.

D. Detailing:
   1. Apply flexible membrane to substrate cracks, and up adjoining vertical surfaces, including integral cove bases, curbs, equipment pads and pipe sleeves.
   2. Embed reinforcing membrane in flexible membrane.

E. Trowel apply body coats to provide smooth, closed, tight surface of required thickness. Smooth off laps, butts and joints in flooring.

F. Cove Bases:
   1. Form integral cove bases up walls, to 4 inch (100 mm) height. Round internal and external corners.
   2. Apply bases according to resinous flooring manufacturer’s instructions, including taping, priming, troweling, sanding, and topcoating.

G. Finish Coats:
   1. Allow body coats to cure properly.
   2. Remove surface imperfections by lightly abrading and vacuuming flooring surface.
   3. Apply two coats of pigmented sealing and finish coating, including grout coat, of types recommended by resinous flooring manufacturer. Apply at spreading rate recommended by manufacturer.
   4. Follow manufacturer's recommended cure times before allowing foot traffic over flooring.

H. Control Joints:
   1. Where flooring is installed over control joints, provide joint in resinous flooring by saw cutting flooring after the final coat and filling joint with flooring manufacturer's recommended epoxy calking material.
   2. Do not permit joints or joining marks where one batch of material adjoins another.

3.4 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

B. Clean resinous flooring just prior to final inspections. Use materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 09 9000

PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work Included: Work of this Section includes, but is not limited to, the following:
1. Field painting and finishing of exposed surfaces of items of architectural, structural, mechanical and electrical Work, interior and exterior, which require paint finish for protection or appearance as shown on Drawings or as specified.
2. Surface preparation and priming of materials required to be painted, but not furnished under Work of other Sections as primed or prepared surfaces.
3. Touch-up painting of prime coats which have become damaged or otherwise abraded or removed during construction.

B. Description of Work Not Included: Certain items of Work shall not be included in Work of this Section unless specific reference is made to painting such items on Drawings or in Specifications. These items include:
1. Shop finished items and materials with factory-applied or integral finish.
2. Concealed surfaces in inaccessible areas such as foundation spaces, furred areas, utility tunnels, pipe spaces and shafts.
3. Finished metal surfaces such as anodized aluminum, stainless steel, chromium plated metal, copper, bronze and other nonferrous metals, unless otherwise indicated.
4. Operating parts of mechanical and electrical equipment including UL and rating labels, and equipment identification, name or nomenclature plates.
5. UL and rating labels on doors, frames, and hardware.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 01 8113 SUSTAINABLE DESIGN REQUIREMENTS for sustainable design requirements and procedures.

B. See Divisions 23 and 26 for additional requirements for painting mechanical and electrical equipment.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Submit manufacturer's specifications and installation instructions for each paint system and material.
2. Include complete listing for each material by product name.
3. Submit detailed paint schedule cross referencing specifications/drawings that conform with legend/abbreviations & nomenclature of all paint types and locations for application throughout building.

B. Samples:

1. Submit samples for each color, texture and sheen prepared on 12 inch (300 mm) square hardboard as required to match Architect's Color Schedule.
2. Samples shall be stepped, to show progressively primers and top coats.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Where shop prime materials are by different manufacturer than finish coat materials, submit certificate signed by both prime and finish coat manufacturers verifying compatibility.

1.5 DEFINITIONS

A. Paint: Coating systems materials, including paints, enamels, stains, varnishes, lacquers, sealers, fillers and other types of applied coating materials whether used as primers, intermediate or finish coats. Standard coating terms defined in ASTM D16 apply to this section.

B. Exposed Surfaces: Surfaces or areas visible in finished Work.

C. Paint Schedule: A guide to finishing various surfaces throughout the Project; not intended as definitive listing of Work.

1.6 SYSTEM REQUIREMENTS

A. Color Requirements:
1. Specified Paint Schedule lists basic painting systems.
2. Prior to beginning painting Work, Architect will prepare and furnish a Color Schedule accompanied by color chips.
3. Color Schedule shall list areas and surfaces to be painted together with colors, textures and

B. Interface with Other Work:
1. Shop primed items: Certain items of Work are specified under other Sections to be shop primed for field painting specified in this Section. Such items include, but are not limited to, the following:
   a. Structural steel, including steel joists and metal deck.
   b. Metal fabrications.
   c. Ornamental metals.
   d. Architectural woodwork (paint finish).
   e. Steel doors and frames.
   f. Wood doors (paint finish).
   g. Access panels.
   h. Coiling doors.
   i. Fire extinguisher and valve cabinets.
   j. Mechanical and electrical equipment and accessories.
2. Shop finished items: Certain items of Work are specified under other Sections to be shop finished and do not require finish painting in field. Such items include, but are not limited to, the following:
   a. Site fencing and furnishings.
   b. Structural steel.
   c. Metal fabrications.

d. Ornamental metals.
e. Architectural woodwork (transparent finish).
f. Roof accessories.
g. Wood doors (transparent finish).
h. Coiling doors.
i. Aluminum entrances and window wall components.
j. Skylights.
k. Metal toilet compartments.
l. Louvers and vents.
m. Prefabricated specialties and accessories.
n. Elevator hoistway doors and frames.
o. Equipment including mechanical and electrical equipment.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

B. B. Maintain records of substrate moisture verifications as required under Part 3: Execution

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver paint to site factory-mixed, ready for application, in original, unopened containers, bearing manufacturer's labels, indicating the following information:
1. Name of material.
2. Manufacturer's stock number and date of manufacture.
3. Contents by volume including major pigment and vehicle constituent.
4. Thinning instructions.
5. Recommended application instrument.
6. VOC content and emissions.
7. Color name and number.

B. Storage:
1. Store materials and equipment in dry storage area.
2. Keep area neat and orderly.
3. Protect storage area surfaces from paint spillage.
4. Maintain paint containers in clean condition, free of foreign materials and residue, protected from freezing.

C. Place paint or solvent soaked rags, waste or other materials which might constitute fire hazard in metal containers and remove from premises at close of each day's Work.

1.10 PROJECT CONDITIONS

A. Environmental Requirements:

1. Apply paint to surfaces which are free of moisture.
2. Do not apply paint in rain, snow, fog or mist or when relative humidity exceeds 85%.
3. During periods of inclement weather, painting may be continued if areas and surfaces to be painted are enclosed and artificial heat is supplied, provided temperature and humidity conditions prescribed are maintained.
4. Do not start interior painting until exterior building openings are closed.
5. Temperature:
   a. Exterior paint: Do not apply exterior paint when ambient temperature is below 50 deg F for water-thinned coatings and below 45 deg F (7 deg C) for other coatings, or when temperature is expected to drop to 32 deg F (0 deg C) within 24 hours of application.
   b. Interior paint: Once interior painting is started, maintain constant temperature of 65 deg F (18 deg C) or above in area of Work.
   c. Prevent variations in temperature which might result in condensation on freshly painted surfaces.
6. Where paint manufacturer's specifications or instructions differ from above, the more stringent requirements apply to this Work.
7. Paint fumes:
   a. Take every precaution against potential hazards of paint fumes as necessary and as required by regulations, codes and laws.
   b. Provide additional ventilation and protective equipment if necessary.

1.11 SEQUENCING AND SCHEDULING

A. In locations to receive floor-mounted equipment, paint floors, equipment pads, and curbs prior installation of equipment.

1.12 EXTRA STOCK

A. Deliver one unopened 5 gallon (19 L) container of paint for each top coat installed for each paint material, sheen and color.

B. Store at Project site where directed. Ensure containers are identified by manufacturer, product, sheen and color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Paint Manufacturers:
   1. Benjamin Moore & Co.
   2. Duron Inc.
   3. Sherwin-Williams Co.

B. Acceptable Manufacturers for Epoxy and Polyurethane Coatings:
   1. Tnemec Company, Inc.
   2. Dupont.
   3. Carboline.

2.2 MATERIALS

A. VOC Content of Field-Applied Interior Paints and Coatings: See Section 01 8113 SUSTAINABLE DESIGN REQUIREMENTS.

B. Coatings:
   1. Provide "best quality grade" of various types of coatings as produced by acceptable paint manufacturers.
   2. Materials not displaying manufacturer's identification as standard "best-grade" product will not be acceptable.

C. Thinners:
   1. Water-thinned systems: Clean, potable water.
   2. Solvent-thinned systems: Pure linseed oil, turpentine, shellac and other materials of highest quality with identifying labels intact and seals unbroken, as recommended by paint manufacturer as suitable for each type of paint.

D. Primers and Undercoats: As recommended by paint manufacturer, suitable for substrate and compatible with finish coat requirements.

E. Galvanizing Repair Paint: High zinc-dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with SSPC Paint 20.

F. Exterior Paint: Non-chalking and mildew resistant.

G. Interior Paint: Withstand washing with mild detergent solution, without loss of color, sheen or pigments.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry (clay and CMU): 12 percent.
   3. Gypsum board: 12 percent.
   4. Plaster: 12 percent.
   5. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Prepare surfaces in accordance with paint manufacturer's instructions.

B. Make substrates clean, dry, smooth, free from dust and other foreign matter which would adversely affect adhesion or appearance.

C. Remove or protect hardware, plates, trim, lighting fixtures and similar items placed prior to painting. Disconnect equipment and temporarily move, where necessary, to permit painting of wall surfaces. Replace removed items upon completion of painting.

D. Touch-up of Prime Coats:
   1. Before applying succeeding coats, touch-up primers and undercoats and remove foreign matter from surface.
   2. Feather spot-priming or spot-coating into adjacent coating to produce smooth and level surface.

E. Repair damaged galvanized coating in accordance with ASTM A780.

F. Do not apply final coats until other trades, whose operations would be detrimental to finish painting, have completed their Work in areas to be painted.

3.3 PREPARATION OF NEW SURFACES

A. Ferrous Metal - Typical Painting Systems:
   1. Clean and prime surfaces, which have not been shop primed, before surface is damaged by weather or other exposure.
   2. Shop-primed items: After installation is completed, touch-up heads of bolts, welded surfaces which are unpainted, and surfaces or areas where primer has been abraded or otherwise damaged.
   3. Prior to application of field coats, remove oil, grease, welding flux residues and other contaminants harmful to painting in accordance with SSPC-SP1 “Solvent Cleaning”.
   4. After solvent cleaning, prepare bare metal surfaces by removing rust scale, loose mill scale or other detrimental deposits in accordance with SSPC-SP3 “Power Tool Cleaning”.

B. Ferrous Metal – High Performance Coating:
   1. Prepare surfaces in strict accordance with coating manufacturer's instructions.
   2. After completion of steel erection, power wash steel using tri-sodium phosphate detergent solution, with minimum pressure of 3000 psi (21 MPa). Rinse throughly with clean water and allow to dry completely.
   3. After cleaning, prepare rusted areas and abraded areas in accordance with SSPC-SP11 “Power Tool Cleaning to Bare Metal”.
   4. After completion of power tool cleaning, spot prime areas that were power tool cleaned, using specified primer. Spot prime the same day that areas were power tool cleaned.

C. Galvanized Steel – Typical Paint:
   1. Prepare steel for painting in accordance with ASTM D6386.

2. Remove passivation film and grease and oil residue from galvanized steel by chemical cleaning and etching, and mechanical methods, to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
   a. Chemically clean and etch using diluted solution of water-reducible phosphoric acid and detergent blend, and water. Dilute, apply, rinse with hot water, and force dry, in accordance with manufacturer's written instructions.
      1) Acceptable product and manufacturer: Equivalent to Clean >n Etch by Great lakes Laboratories.
   b. Mechanically abrade surface in accordance with SSPC-SP3 "Power Tool Cleaning".
3. Test surfaces using one of the following methods:
   a. Copper sulfate test: Apply one drop of a 10% copper sulfate solution to the treated/rinsed/dried surface. If a black spot develops within 5 seconds of contact, the surface is ready for painting. If a black spot does not develop within 5 seconds of contact, provide additional cleaning and etching, and re-test until a black spot does so develop.
   b. Water break test: Spray water on the treated/rinsed/dried surface. If the water beads or breaks, the surface is not ready for paint; provide additional cleaning and etching, and re-test until water sheets over the surface. If the water sheets over the surface, it is a good signal that the passivation film and other oily soil has been removed, and the surface is ready for painting.

D. Galvanized Steel – High Performance Coating:
1. Clean surfaces of oil, grease and other soluble contaminants in accordance with SSPC-SP1 "Solvent Cleaning".
   a. Use solvent in hot 140 deg F (60 deg C) water, or as recommended by paint manufacturers, using power wash or rags. Change cleaning rags frequently so that contaminants are not re-deposited on steel.
   b. Thoroughly rinse surfaces with clean water to remove solvent.
2. After solvent cleaning, clean surfaces of rust and other insoluble contaminants in accordance with SSPC-SP2 "Hand Tool Cleaning" or SSPC-SP3 "Power Tool Cleaning".
3. Test surfaces by wiping a clean white cloth across cleaned surfaces. If cloth remains clean, surfaces are ready for painting. If cloth becomes dirty, do not paint; provide additional cleaning and re-test until cloth remains clean.

E. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk.
2. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Clay Masonry:
1. Remove efflorescence and chalk.
2. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

G. Concrete Masonry:
1. Remove efflorescence and chalk.
2. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

H. Gypsum Board:

1. Repair surface defects including cracks, depressions or holes with gypsum board joint finishing compound as specified in Section 09 2900 GYPSUM BOARD.
2. Fill out flush and sand smooth.
3. Clean surfaces of dust dirt and other contaminants.
4. Do not begin paint application until finishing compound is dry.

I. Concrete Floors - Epoxy Finish:
1. Test slabs for moisture:
   a. First test using polyethylene film test.
      1) Tape 12 inch (300 mm) square sheet of polyethylene vapor barrier to slab. Seal all edges with plastic moisture-resistant tape.
      2) If, after 24 hours of polyethylene film test, there is "clouding" or drops of moisture on underside of film, there is too much moisture in concrete substrate; do not apply paint. In such case, perform calcium chloride test.
   b. Calcium chloride test
      1) Place quarter teaspoonful of dry (anhydrous) calcium chloride crystals inside 3 inch diameter putty ring on surface of concrete. Cover with a glass (embed edge of glass in putty), so that crystals are totally sealed off from air.
      2) If crystals dissolve within 12 hours, there is too much moisture in concrete substrate; do not apply paint.
   c. Provide ventilation to reduce moisture content of concrete slabs to receive paint to not more than 3 pounds per 1000 square feet (1.46 kg per 100 square meters), before applying paint.
2. Shot-blast, mechanically abrade, or acid etch concrete floors to remove laitance, curing compounds, oil, grease, and other contaminants, and to provide surface texture to receive paint.

J. Wood:
1. Sand wood surfaces and edges smooth and even, before finishing or painting and between coats. Remove dust after each sanding.
2. Do not prime wood in building during erection of masonry.
3. Remove residue from knots, pitch streaks, cracks, open joints and sappy spots. On wood surfaces to be painted, apply shellac to knots, pitch and resinous sapwood before applying prime coat.
4. Countersink fasteners and fill fastener holes, cracks, open joints and other defects with tinted putty or wood filler after primer is dry and before second coat. Sand putty or wood filler smooth before painting.
5. Allow pressure-treated wood to weather for length of time recommended by paint manufacturer, before paint application.

3.4 PREPARATION OF EXISTING SURFACES

A. Remove blistered, peeling and scaling paint or chalk deposits to sound substrates.

B. Completely remove sealants or caulking.

C. Dull glossy surfaces.

D. Ferrous Metal:

1. Clean surfaces of oil, grease and other soluble contaminants in accordance with SSPC-SP1 "Solvent Cleaning".
2. Clean surfaces of rust and other insoluble contaminants in accordance with SSPC-SP2 "Hand Tool Cleaning" or SSPC-SP3 "Power Tool Cleaning".
3. Sand clean and spot prime.

E. Galvanized Steel:
1. Clean surfaces of oil, grease and other soluble contaminants in accordance with SSPC-SP1 "Solvent Cleaning".
2. Wire-brush or power wash weathered, unpainted surfaces to remove "white rust" deposits.
3. Sand clean and spot prime.

F. Ferrous Metal to Receive Electrostatically-Applied Paint:
1. Surfaces must be clean and dry, and free of dust, grease, oil, silicones, wax and rust.
2. Sand glossy and chipped areas with 400-grit abrasive paper.
3. Wipe clean using detergent solutions or high quality lacquer thinner as recommended by paint manufacturer.

G. Masonry, Portland Cement Plaster (Stucco) and Concrete:
1. Fill cracks and voids.
2. Remove mildew by scrubbing or power wash equipment using commercial mildew wash.

H. Gypsum Board:
1. Sand to feather edges smooth with adjacent surfaces.
2. Repair cracks and voids and spot prime.
3. Provide solvent wash for areas with greasy marking.
4. Provide detergent wash where required for adhesion of paint.

I. Gypsum Plaster:
1. Sand to feather edges smooth with adjacent surfaces.
2. Repair cracks and voids and spot prime.
3. Provide solvent wash for areas with greasy marking.
4. Provide detergent wash where required for adhesion of paint.

J. Wood - Paint (Opaque) Finish:
1. Putty cracks, crevices and nail holes.
2. Remove mildew by scrubbing or power wash equipment using commercial mildew wash.
3. Spot prime bare wood prior to applying an overall coat of primer.

K. Wood - Transparent Finish:
1. Remove existing paint to wood substrates by sanding and scraping. Do not damage existing profiles and surfaces.
2. Use chemical removers only if recommended by paint manufacturer.
3. Review cracks, crevices or fastener holes with Architect prior to filling to determine extent and technique.

3.5 APPLICATION

A. Manufacturer's Instructions:

1. Follow paint manufacturer's instructions; do not exceed manufacturer's recommended application rate.
2. Use application materials and equipment recommended by paint manufacturer.
3. Stir materials before application to produce mixture of uniform density. Re-stir as required during application.
4. Use thinners only if recommended by paint manufacturer.
5. Provide total dry film thickness recommended by paint manufacturer for conditions of use. Owner reserves the right to verify mil thicknesses.

B. Painting:
1. Number of coats specified are minimum number acceptable.
2. Allow each coat of paint, varnish and enamel to dry thoroughly before applying succeeding coats.
3. Use products of same manufacturer for succeeding coats.
   a. Where shop primed materials are field painted, or prime coat materials are by different manufacturer than finish coat materials, confirm compatibility of materials and submit required certification.
4. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping.
5. Make each coat of paint slightly different shade from preceding coat.
6. Final colors shall match approved samples.

C. Painting Mechanical and Electrical Items:
1. When covered and uncovered pipes, conduits, hangers and rods pass through finished room or space, paint with type of undercoat materials consistent with material to be painted and with same type and color of finish coat as used on immediately adjacent walls or ceiling surfaces, whichever surface is most appropriate to be matched, or color code as specified in Division 23.
2. Give pumps, fans, heating and cooling units two coats of paint unless factory finished (or unless painting is specified under other Sections).
3. Paint interior of ducts black behind grilles or registers exposed to view or which reflect light.
4. Do not paint name plates or polished surfaces of equipment. Leave clean and free of paint.

D. Painting Miscellaneous Items and Areas:
1. Paint shop-primed door hinges same color as door frames to which attached, unless a different color is selected. Do not paint door hardware which have plated finishes.
2. Finish tops, bottoms and edges of doors same as faces of doors.
3. Finish closets same as adjoining rooms, unless otherwise specified.
4. Finish other surfaces not specifically mentioned same as adjoining surfaces.
5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

E. Painting Existing Toilet Partitions and Elevator Hoistway Doors and Frames: Electrostatically repaint in place.

F. Touch-up:
1. Touch-up and restore finish where damaged.

2. If stain, dirt or undercoats show through final coat of paint, correct defects and cover with additional coats until coating or paint film is of uniform finish, color, appearance and coverage.
3. Give special attention to edges, corners, crevices, welds, exposed fasteners and similar items to be sure these areas receive dry film thickness equivalent to flat surfaces.

3.6 CLEANING

A. At completion of each day's Work, remove from premises rubbish and accumulated materials caused by this Work.

B. Clean off paint spots, oil and other soiling from pre-finished surfaces and surfaces with integral finish. Use solvents which will not damage finished surface.

3.7 EXTERIOR PAINT SCHEDULE

A. Exterior Ferrous Metal - Alkyd Finish:
1. Primer: Rust inhibiting alkyd primer; touch up shop primed items.
2. Second coat: Alkyd enamel, semi-gloss .
3. Third coat: Same as second coat.

B. Exterior Ferrous Metal - Polyurethane Finish:
1. Primer: Moisture-cure organic zinc-rich urethane primer; 2.5 to 3.5 mils (0.064 to 0.089 mm) dry film thickness; touch up shop primed items.
2. Second coat: Epoxy-polymide coating; 4.0 to 6.0 mils (0.102 to 0.152 mm) dry film thickness.
3. Third coat: Acrylic polyurethane enamel, semi-gloss; 2.5 to 3.0 mils (0.064 to 0.076 mm) dry film thickness.
4. Locations: Exposed structural steel

C. Exterior Galvanized Metal - Alkyd Finish:
1. Primer: Acrylic primer ; touch up shop primed items.
2. Second coat: Alkyd enamel, semi-gloss .
   a. Acceptable product and manufacturer: Equivalent to Super Spec HP UrethaneAlkyd
3. Third coat: Same as second coat.

D. Exterior Galvanized Metal - Polyurethane Finish:
1. Primer: Epoxy-polymide coating; 4.0 to 6.0 mils (0.10 to 0.16 mm) dry film thickness. ; touch up shop primed items.
2. Second coat: Acrylic polyurethane enamel, semi-gloss; 2.5 to 3.0 mils (0.064 to 0.076 mm) dry film thickness.
3. Locations: Exposed structural steel.

E. Exterior Concrete, Brick and Concrete Masonry Units - Vinyl Acrylic Finish - New Surfaces:
1. First coat: Vinyl acrylic latex, low lustre.
2. Second coat: Same as first coat.

F. Exterior Concrete, Portland Cement Plaster (Stucco), Brick and Concrete Masonry Units - Vinyl Acrylic Finish - Existing Surfaces:
1. Primer: Penetrating liquid surface conditioner.

2. Second coat: Vinyl acrylic latex, low lustre.
3. Third coat: Same as first coat.

G. Exterior Wood - Alkyd Finish:
1. Primer: Long oil alkyd enamel ; touch up shop primed items.
2. Second coat: Alkyd enamel, gloss.
3. Third coat: Same as second coat.

H. Exterior Wood - Opaque Stain Finish:
1. First coat: Vinyl acrylic latex, solid color stain.
2. Second coat: Same as first coat.

I. Exterior Wood - Semi-Transparent Stain Finish:
1. First coat: Linseed-alkyd semi-transparent stain.
2. Second coat: Same as first coat.

J. Exterior Wood Semi-Solid Stain Finish:
1. First coat: Linseed oil semi-solid stain.
2. Second coat: Same as first coat.

3.8 INTERIOR PAINT SCHEDULE

A. Interior Ferrous Metal - Acrylic-Latex Finish:
1. Primer: Acrylic primer ; touch up shop primed items.
2. Second coat: Low-VOC acrylic-latex interior paint; semi-gloss.
3. Third coat: Same as second coat.

B. Interior Concrete Walls and Structure - Acrylic-Latex Finish:
1. First coat: Low-VOC interior primer.
2. Second coat: Low-VOC acrylic-latex interior paint; eggshell.
3. Third coat: Same as second coat.

C. Interior Concrete Masonry Units - Acrylic-Latex Finish:
1. Primer: Vinyl acrylic latex block filler.
2. Second coat: Low-VOC acrylic-latex interior paint; eggshell.
3. Third coat: Same as second coat.

D. Interior Gypsum Board - Acrylic-Latex Finish - Semi-Gloss:
1. First coat: Low-VOC interior primer.
2. Second coat: Low-VOC acrylic-latex interior paint; semi-gloss.
3. Third coat: Same as second coat.
4. Locations: Walls in wet areas, including but not limited to restrooms, janitor closets, and trash rooms.

E. Interior Gypsum Board and Plaster - Acrylic-Latex Finish - Eggshell:
1. First coat: Low-VOC interior primer.
2. Second coat: Low-VOC acrylic-latex interior paint; eggshell.
3. Third coat: Same as second coat.
4. Locations: Walls other than to receive semi-gloss.

F. Interior Gypsum Board and Plaster - Acrylic-Latex Finish - Flat:
   1. First coat: Low-VOC interior primer.
   2. Second coat: Low-VOC acrylic-latex interior paint; flat.
   3. Third coat: Same as second coat.
   4. Locations: Ceilings and soffits.

G. Interior Wood - Acrylic-Latex Finish:
   1. First coat: Low-VOC interior primer.
   2. Second coat: Low-VOC acrylic-latex interior paint; semi-gloss.
   3. Third coat: Same as second coat.

H. Interior Ferrous Metal - Polyurethane Finish:
   1. Primer: Moisture-cure organic zinc-rich urethane primer; touch up shop primed items; 2.5 to 3.0 mils (0.064 to 0.076 mm) film thickness.
   2. Second coat: Epoxy-polyamide coating; 2.0 to 3.0 mils (0.051 to 0.076 mm) dry film thickness.
   3. Third coat: Acrylic polyurethane enamel, semi-gloss; 2.5 to 3.0 mils (0.064 to 0.076 mm) dry film thickness.

I. Interior Ferrous Metal - Electrostatically-Applied Finish:
   1. Primer: Universal primer, to act as barrier coat over shop primer.
   2. First coat: Alkyd enamel specifically blended for electrostatic application; semi-gloss enamel.
      a. Acceptable product and manufacturer: Equivalent to Per-Ma-Lite Electrostatic Semi-Gloss Enamel by Budeke's.
   3. Second coat: Same as first coat.
   4. Locations: Toilet partitions. Elevator hoistway doors and frames.

J. Interior Wood - Transparent Finish:
   1. Filler: natural color paste wood filler; tint to match color of stain.
   2. First coat: Alkyd penetrating stain; color as required to match Architect's sample.
   3. Second coat: Clear polyurethane coating, gloss low; thin 1:4, mineral spirits to polyurethane.
   4. Third coat: Same as second coat, but apply as packaged with no thinning; sand lightly between finish coats.
   5. Fourth coat: Same as third coat; sand lightly between finish coats.

K. Paint Locations:

L.

	No Sheen (Flat)	Low Sheen (Eggshell or Satin)	High Sheen (Semi-Gloss)
Administrative offices and workrooms		x	
Classrooms, including Art and Science Labs		x	
Hallways above wainscot		x	
Group toilet rooms above wainscot			x
Single-user toilet rooms above wainscot			x
Locker Rooms			x
Student Dining		x	
Kitchen & Servery			x
Mechanical, Electrical, and IT rooms		x	
Storage rooms		x	
GWB ceilings and soffits	x	x	
Natatoriums		x	
Gymnasium, Fitness, and Weight Rooms		x	
Black-Box and Stage areas	Black		

M. END OF SECTION

SECTION 10 2113

TOILET COMPARTMENTS

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. Description of Work: Work of this Section includes, but is not necessarily limited to, the following:
   1. Floor anchored and ceiling hung, solid, high-density polyethylene (HDPE) toilet compartments.
   2. Urinal screens.
   3. Accessories.
   4. Interior light gage partition walls coordination.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 09 2110 GYPSUM BOARD ASSEMBLIES.

B. See Section 10 2813 TOILET ACCESSORIES for partition mounted accessories.

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Submit manufacturer's specifications and installation instructions for components and finish.
   2. Include photographic catalog cuts for manufacturer's standard components, including hardware, anchors and fasteners.

B. Shop Drawings: Submit plans, elevations and details of compartments, showing layout, dimensions and anchoring details to adjacent construction. Indicate vertical clearance AFF and horizontal clearances available for maneuvering near entryway doors and partitions

C. Samples: Submit selection of samples for **[color and]** verification for each exposed product and for each color and texture specified. Submit large samples and not standard sample size.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit cleaning and maintenance data for materials provided.
   2. Include copy of submittal in Project information manual.

B. Warranty: Submit signed and dated warranty.

1.6 SYSTEM REQUIREMENTS

A. Interface With Other Systems:
   1. Coordinate compartment Work with Work of other trades and provide items to be placed during installation of other Work at proper time so as to avoid delays in overall Work. Coordinate wood blocking locations during construction of interior gypsum board partition walls.
   2. Place such items, including inserts and anchors, accurately in relation to final locations of compartment components.
   3. Use Contractor's bench marks.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

B. Regulatory Requirements:
   1. Conform to applicable requirements of authorities having jurisdiction over Project.
   2. Except as may be modified by governing authorities, comply with applicable requirements and provisions of the following:
      a. ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People".
      b. Americans with Disabilities Act.

1.8 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site to review installation procedures and coordination with other Work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Store in protected and dry area in manufacturer's unopened protective shipping packaging.

C. Support as required to prevent damage to materials.

1.10 PROJECT CONDITIONS

A. Field Dimensions:
   1. Field verify dimensions of supporting structure and other adjoining elements before fabrication.
   2. Provide for erection tolerances corresponding with specified tolerances for other Work where field measurements cannot be obtained.
   3. Remedy unsatisfactory tolerances in adjoining Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Basis of design product is Eclipse Partitions by Scranton Products to establish standard of quality.
   2. Equivalent products by the following may also be acceptable provided they meet the requirements of Contract Documents.
      a. Rockville Partitions Incorporated.

2.2 MATERIALS

A. Door, Panel, and Pilaster Construction:
   1. Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
   2. Color and pattern: As indicated on Color Legend on Drawings.
   3. Dimensions: Manufacturer's standard.

2.3 ACCESSORIES

A. Hardware:
   1. Provide manufacturer's standard heavy-duty fastenings and fittings.
   2. Door hardware:
      a. Continuous self-closing stainless steel hinges. For out-swing doors, provide hinges with integral stop to limit door swing, so that bumper on outside of door is not necessary.
      b. Latch and keeper:
         1) Surface mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper.
         2) Provide units that comply with accessibility requirements of authorities having jurisdiction.
      c. Combination coat hook/bumper.
      d. Door pulls. Provide pull on both faces of door for wheelchair-accessible compartments.
   3. Material and finish: Manufacturer's standard.

B. Brackets and Fittings:
   1. General: Provide as required for complete and rigid installations compatible with substrate conditions.
   2. Brackets:
      a. Stirrup type: Ear or U-brackets, stainless steel.
      b. Full-height (continuous) type: Manufacturer's standard design and material.
   3. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
   4. Pilaster shoes and sleeves (caps): Manufacturer's standard.
   5. Headrails: Continuous extruded aluminum, with anti-grip profile.
   6. Support posts for urinal screens: Manufacturer's standard aluminum post with floor shoe for anchoring to floor construction.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide hex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Shop fabricate units in accordance with field dimensions indicated on final Shop Drawings.

B. Provide sizes indicated, adjusted to actual field measurements.

C. Fabricate with flat, smooth surfaces, free of waves, warping, buckles, rough areas and voids.

D. Provide concealed internal metal reinforcement for attachment of brackets, hardware, grab bars, accessories and anchoring devices. Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Provide cut-outs for Work indicated or required.

F. Floor-Anchored Overhead-Braced Units:
1. Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions.
2. Make provisions for setting and securing continuous head rail at top of each pilaster.
3. Provide shoes at pilasters to conceal supports and leveling mechanism.

G. Door Widths: As indicated.

H. Urinal-Screen Construction: Matching panels.

I. Complete fabrication at factory, including drilling, tapping and assembly, to extent possible within delivery limitations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Installation:
1. Install in accordance with final Shop Drawings and manufacturer's instructions.

B. Avoid scratching or damage to finishes.

C. Do not install units which are warped, bowed, deformed or otherwise damaged.
1. Install compartments rigid, straight, plumb and level.
2. Set units with not more than 1/2 inch between pilasters and panels, and not more than 1 inch clearances between panels and walls.

3. Floor-anchored overhead-braced units:
   a. Secure pilasters to floor and level, plumb, and tighten.
   b. Secure continuous head rail to each pilaster with not less than two fasteners.
   c. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
4. Install wall-hung urinal screens on three (minimum) heavy wall brackets attached to panel with through-bolts. Provide devices for wall anchorage appropriate for supporting substrate construction.

D. Hardware Adjustment:
   1. Adjust and lubricate hardware for proper operation after installation.
   2. Set hinges on in-swing doors to hold doors open approximately 30° from closed position when unlatched.
   3. Set hinges on out-swing doors to return to fully closed position.

3.3 CLEANING AND ADJUSTMENTS

A. Perform final adjustments to leveling devices, door hardware and other operating parts.

B. Clean exposed surfaces and touch up minor finish imperfections using materials and methods recommended by compartment manufacturer.

C. Replace damaged units which cannot be satisfactorily field repaired, as directed by Architect.

3.4 PROTECTION

A. Protect compartments during construction so that they will be without evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Toilet accessories.
   2. Framed mirrors.
   3. Accessories.
   4. Coordinate accessory location with partition wall framing.

B. Products Furnished But Not Installed: Furnish inserts and anchors which must be set in concrete or built into masonry; coordinate delivery with other Work to avoid delay.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 09 2110 GYPSUM BOARD ASSEMBLIES.

B. See Section 10 2113 TOILET COMPARTMENTS for compartment construction.

C. See Division 26 for electrical connection requirements for hand dryers.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Submit manufacturer's specifications and installation instructions for each component and finish detailed under Part 2 of this specification: Toilet and Bath Accessory Schedule.
   2. Include photographic catalog cuts for manufacturer's standard components, including hardware, anchors and fasteners. Include schematic details showing elevations and layout, dimensions and anchoring details to adjacent construction. Indicate vertical clearance AFF and horizontal clearances available for maneuvering near entryway doors and partitions.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data: Submit cleaning and maintenance data for materials provided.

B. Warranty: Submit signed and dated warranty.

1.5 SYSTEM REQUIREMENTS

A. Interface With Other Systems:
   1. Coordinate toilet accessory Work with Work of other trades and provide items to be placed during installation of other Work at proper time so as to avoid delays in overall Work. Especially coordinate wood blocking locations during construction of interior gypsum board partition walls.

2. Place such items, including inserts and anchors, accurately in relation to final locations of cabinet components.
3. Use Contractor's bench marks.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain accessory items from one manufacturer except where otherwise indicated.

B. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

C. Regulatory Requirements:
1. Conform to applicable requirements of authorities having jurisdiction over Project.
2. Except as may be modified by governing authorities, comply with applicable requirements and provisions of the following:
   a. ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People".
   b. Americans with Disabilities Act.

D. 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 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site to review installation procedures and coordination with other Work.

1.8 PROJECT CONDITIONS

A. Field Dimensions:
1. Field verify dimensions of supporting structure and other adjoining elements before fabrication.
2. Provide for erection tolerances corresponding with specified tolerances for other Work where field measurements cannot be obtained.
3. Remedy unsatisfactory tolerances in adjoining Work.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Store in protected and dry area in manufacturer's unopened protective shipping crates or packaging.

C. Protect factory applied protective face coverings from damage.

D. Support as required to prevent any damage to materials.

1.10 WARRANTY

A. Provide written 10 year warranty for replacement of mirror units which develop visible silver spoilage defects within warranty period.

B. Provide manufacturer's written warranty for hand dryers, warranting to repair or replace defective parts or workmanship as follows:
   1. Motor brushes: 3 years from Substantial Completion.
   2. All other parts: 10 years from Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
   1. Products scheduled on Drawings establish standard of quality and are manufactured by Bobrick Washroom Equipment, Inc.
   2. Equivalent products by following are acceptable:
      a. Bradley Corp.

2.2 MATERIALS

A. Stainless Steel:
   1. Type 304, manufacturer's standard thickness, unless otherwise indicated.
   2. Finish: No. 4 bright directional polish, unless otherwise noted.

B. Mirror Glass:
   1. ASTM C1503, Mirror Select Quality; with silvering, electro-plated copper coating, and protective organic coating.
   2. Minimum thickness: 1/4 inch (6 mm).

2.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Accessory types scheduled below correspond to types indicated on Drawings.

B. Hand Dryer:
   1. Low voltage polycarbonate housing with ABS plastic mounting plate.
   2. Antimicrobial sprayed nickel paint coating.
   3. Double-life HEPA filter.
   4. Touch-free sensor to activate.
   5. Operating airflow: Up to 7.39 gal/sec and up to 59.3 cfm.
   6. Acceptable product: Airblade V by Dyson.

C. Paper Towel Dispenser:
   1. Description: Roll paper towel capacity with translucent dark grey plastic housing.
   2. Mounting: Surface.
   3. Acceptable product and manufacturer: Equivalent to 72860 by Bobrick.

D. Toilet Tissue Dispensers:

1. Description: Double roll capacity with shelf.
2. Mounting: Surface.
3. Acceptable product and manufacturer: Equivalent to B-2840 by Bobrick.

E. Feminine Napkin Dispensers:
1. Description***:***
   a. Capacity for 30 napkins and 27 tampons.
   b. Fabricate with seamless beveled flange.
2. Operation: Token operation, with handles complying with operating requirements of ADA and ANSI A117.1.
3. Mounting: Recessed.
4. Acceptable product and manufacturer: Equivalent to Classic Series B-3706T by Bobrick.

F. Feminine Napkin Disposals:
1. Description: Removable keyed receptacle with self-closing access doors on both sides, and 1.2 gallon (4.5 L) leakproof rigid polyethylene receptacle..
2. Mounting: Compartment.
3. Acceptable product and manufacturer: Equivalent to Classic Series B-354 by Bobrick for single sided and B354 for double sided.

G. Soap Dispensers:
1. Description: Bulk foam soap dispenser with large push bar.
2. Mounting: Wall.
3. Acceptable product and manufacturer: Equivalent to ClearVu Bulk Foam Soap Dispenser by Impact Products, LLC.

H. Grab Bars:
1. Description:
   a. 1-1/2 inch (38 mm) diameter x 0.05 inch (1.3 mm) thick, satin finish; with mounting flange welded to grab bar, and snap-on flanges for concealed attachment. Concealed set-screw mounting is not acceptable. Exposed mounting is not acceptable.
   b. Provide with manufacturer's concealed anchor plates to suit wall and toilet compartment construction.
2. Configurations and lengths: Straight; ***??*** inches (***??*** mm long).
3. Mounting: Surface.
4. Installed grab bars shall have 1-1/2 inch (38 mm) projection from walls, and withstand minimum 250 pound (1112 N) force.
5. Acceptable products and manufacturer: Equivalent to B-6806 Series by Bobrick.

I. Framed Mirrors:
1. Description:
   a. Stainless steel framed mirror with concealed theft-resistant wall hangers.
   b. Fabricate frames of stainless steel angle, with corners heliarc welded and ground and polished smooth.
   c. Mirror back of minimum 0.040 inch (1.0 mm) thick galvanized steel, fastened to frame with concealed screws.
2. Sizes: As indicated on Drawings.
3. Mounting: Surface.

4. Acceptable product and manufacturer: Equivalent to B-290 by Bobrick.

J. Janitorial Utility Shelf:
1. Description: Stainless steel utility shelf with support brackets welded to shelf, with 3 mop/broom holders of spring-loaded serrated rubber cams with plated steel brackets, 4 rag hooks, and continuous rag bar.
2. Length: 34 inches.
3. Mounting: Surface.
4. Acceptable product and manufacturer: Equivalent to B-239 by Bobrick.

K. Shower Rods:
1. Stainless steel, extra-heavy duty, 1-1/4 inch (32 mm) diameter, 0.05 inch (1.3 mm) thick with slide-on stainless steel flanges and countersunk screws.
2. Provide in lengths to suit showers, as indicated.
3. Acceptable products:
   a. Equivalent to Classic Series B-6047.

L. Soap Dishes:
1. Description: Stainless steel, bright polished; drawn, one-piece ribbed dish welded to support arm and flange; drain holes.
2. Mounting: Surface.
3. Acceptable product and manufacturer: Equivalent to Classic Series B-6807 by Bobrick.

M. Bariatric Shower Seats:
1. Description: Folding shower seat with "L"-shaped slatted seat.
   a. Seat: Plastic laminate, consisting of matte-finish ivory melamine surfaces integrally bonded to black phenolic-resin core; nominal 18 inch (457 mm) wide x 16 inch (406 mm) deep x 5/16 inch (8 mm) thic**k**.
   b. Frame: Stainless steel framing with self-locking mechanism.
2. Mounting: Surface.
3. Installed seats shall withstand minimum 1100 pound force.
4. Acceptable product and manufacturer: Equivalent to B-918116 by Bobrick.

N. Diaper Changing Stations:
1. Description:
   a. Hinged fold-down diaper changing table fabricated of molded polyethylene over foam plastic core, with nylon straps to secure baby on table, and purse hooks.
   b. Bed section hinges to back plate with concealed, full-length stainless steel hinge rod; controlled opening and closing via pneumatic cylinder.
   c. Color of plastic: Manufacturer's standard cream or gray.
2. Installed table shall support minimum 250 pound static force.
3. Operable with one hand, with not more than 5 pounds (22.2 N) force.
4. Mounting: Surface.
5. Acceptable product and manufacturer: Equivalent to Koala-Kare KB100-SSRE by Bobrick.

2.4 ACCESSORIES

A. Inserts, Anchors and Fasteners:

1. Provide concealed fastenings wherever possible. Where exposed fastenings are required, match finish of fastenings to finish of accessories fastened thereby.
2. Provide fasteners recommended by accessory manufacturer, appropriate for proper attachment to supporting substrates.
3. Provide theft-resistant fasteners for exposed mountings.

B. Keys: Furnish minimum of 6 universal keys to Owner, for access to toilet accessory units requiring internal access for servicing or resupply.

2.5 FABRICATION

A. Fabricate units with tight seams and joints, and exposed edges rolled.

B. Exposed welds will not be accepted. Exposed weld spots will not be accepted.

C. Hang doors and access panels with full-length, continuous hinges.

D. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install only after completion of contiguous Work.

C. Set Work accurately, measured from established building lines and levels, plumb and in true alignment with previously completed Work.

D. Anchor securely to supporting construction, using concealed fasteners wherever possible.

3.3 CLEANING, ADJUSTMENT AND REPAIR

A. Adjust components to operate properly and verify that mechanisms function properly and smoothly.

B. Remove protective coverings only when danger of damage from other Work is passed.

C. Clean and polish exposed surfaces prior to final acceptance.

D. Repair and/or replace damaged units.

3.4 PROTECTION

A. Protect Work during construction so that it will be without any evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 12 2400

WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Manually-operated window shades.
   2. Electrically-operated shades for exterior windows as indicated on Drawings.
   3. Accessories.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 09 2900 GYPSUM BOARD for ceiling pocket construction.

B. See Division 26 for electrical and wiring requirements.

1.3 ACTION SUBMITTALS

A. Product Data: Submit for each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
   1. Motorized shade operators: Include operating instructions.
   2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Provide project-specific Shop Drawings, drawn to scale.
   1. Show location and extent of roller shades.
      a. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
      b. Include reflected ceiling plans showing ceiling suspension system members and attachment to building structure.
   2. Motorized shade operators:
      a. Show size and location of access to shade operator, motor, and adjustable components.
      b. Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
      c. Include wiring diagrams showing power, system, and control wiring.
   3. Include field-measured dimensions of each opening to receive shades.
   4. Number each shade on Shop Drawing to correspond to identification number given each shade and applied on an unexposed face of shade unit.

C. Samples:
   1. Manufacturer's samples: Submit manufacturer's full range of standard pattern and color samples for each type of shade fabric, for Architect's selection.

2. After selection, submit shade fabric samples for each type of shade fabric, 12 inches square, in selected colors and patterns.

1.4 INFORMATIONAL SUBMITTALS

A. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

B. Qualification Data: Submit installer qualifications verifying experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data:
1. Include the following:
a. Methods for maintaining roller shades and finishes.
b. Precautions about cleaning materials and methods that could be detrimental to shadecloth, finishes, and performance.
c. Operating hardware.
d. Motorized shade operator.
2. Include copy of submittal in Project information manual.

B. Warranties: Submit signed and dated warranties.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain shades for windows through one source from a single manufacturer.

B. Installer Qualifications: Approved by shade manufacturer for warranted installation of shades.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Resistance Ratings: Passes NFPA 701.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Product Standard: Provide shades complying with WCMA 100.1.

1.7 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions; in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

B. Store in protected and dry area in manufacturer's unopened protective shipping packaging.

C. Support as required to prevent damage to materials.

1.9 PROJECT CONDITIONS

A. Field measure dimensions of each opening to receive shades, before fabrication.

B. Environmental Requirements: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.10 SEQUENCING AND SCHEDULING

A. Do not install shades until wet Work and finishing operations, including painting, are complete and dry.

1.11 WARRANTIES

A. Provide manufacturer's standard warranties in which manufacturer agrees to repair or replace components of roller shades that fail in materials or workmanship within specified warranty period.
   1. Manual operating components: Installation shall remain operational, without fault; including all operating parts excepting bead chain.
   2. Motors and electrical components: Installation shall remain operational, without fault; including motors, electrical controls, and override circuits.
   3. Shadecloth: Shadecloth shall not deteriorate, sag or warp; and shall not be unfit for use intended.
   4. Warranty periods: As follows, from date of Substantial Completion.
      a. Manual operating components: Ten years.
      b. Motors and electrical components: Two years.
      c. Shadecloth: Ten years.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURER

A. Acceptable Products and Manufacturer:
   1. Listed products establish standard of quality and are manufactured by MechoShade Systems, Inc
   2. Equivalent products by the following manufacturers are acceptable provided they comply with requirements of Contract Documents.
      a. Draper Inc.

b. Nysan Solar Control.

2.2 SHADE TYPES

A. Shade Types: See Drawings for locations of each shade type.

2.3 SHADECLOTH

A. Sunscreen Shadecloth: Non-PVC shadecloth.
1. Material: TPO (thermoplastic olefin) filaments with TPO coating.
2. Pattern: Basketweave.
3. Color:
4. **[Architect to provide].**
5. Openness factor: **[Architect to provide].**

B. Room Darkening Shadecloth:
1. Material: 53% fiberglass, 45% acrylic, 2% poly finish.
2. Pattern: Solid opaque.
3. Color: **[Architect to provide].**
4. .
5. Openness factor: Zero.

2.4 SHADES

A. Descriptions:
1. Manually-operated window shades: Manually-operated window shade systems, consisting of shade fabric, chain-and-sprocket mechanism for operable units, mounting hardware and other accessories as required for complete installation.
2. Electrically-operated window shades: Motorized window shade system consisting of shade fabric, electric motor system, electrical switching and control systems, hardware and other accessories as required for complete installation.

B. Rollers:
1. Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material.
2. Provide capacity for one roller shade band(s) per roller.

C. Direction of Roll: Regular, from back of roller.

D. Mounting Brackets and Devices: Provide manufacturer's mounting brackets as applicable to conditions of installation, as follows.
1. Pocket-mounted shades: Extruded aluminum pocket with removable extruded aluminum closure strip in size recommended by shade manufacturer for conditions of installation.
a. Drill holes or slots in top of housings, to provide minimum free area of 1 square inch (645 sq. mm) of ventilation per foot of glass width, for venting of air space between shade and glass when shade is down.

E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.

F. Bottom Bar: Steel or extruded aluminum.
   1. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
   2. Heat-seal shadecloth on top and sides around bottom bar with straight seams, so that bottom bar is fully enclosed on all sides.

G. Room Darkening Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with fascia and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.

H. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

I. Manual Shade Operation: Continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.
   1. Position of clutch operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
   2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
   3. Lift-assist mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
   4. Loop length: Length required to make operation convenient from floor level.
   5. Bead chain: Nickel-plated metal.
   6. Operating function: Stop and hold shade at any position in ascending or descending travel.

J. Electrical Shade Operation: Motorized operator, switch operated.

2.5 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components:
   1. Noncorrodible or corrosion-resistant-coated materials.
   2. Lifting mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Shade units installed outside jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish:
1. For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
2. Colors of metal and plastic components exposed to view: As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.6 MOTORIZED ROLLER SHADE OPERATORS

A. Description:
1. Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated.
2. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction.
3. Include wiring from motor controls to motors.
4. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
5. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

B. Comply with NFPA 70.

C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

D. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
1. Service factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor characteristics: Single phase; 24 V, 60 Hz, or 110 V, 60 Hz, as standard with manufacturer.
3. Motor mounting: Within manufacturer's standard roller enclosure.

E. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

F. Operating Features
   1. Backup gear and crank operator for manual operation during power failures with detachable handle, length required to make operation convenient from floor level.

2.7 ACCESSORIES

A. Miscellaneous Accessories: Provide anchors, fasteners and other accessories required for complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

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

3.2 INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass.

B. Connections: Connect motorized operators to building electrical system.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.3 CLEANING AND REPAIR

A. Clean shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION

SECTION 12 3553

WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wood laboratory casework.
2. Laboratory countertops.
3. Tables.
4. Shelves.
5. Laboratory sinks.
6. Laboratory accessories.
7. Water, laboratory gas, and electrical service fittings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 21 for plumbing requirements.

B. See Division 23 for HVAC requirements.

C. See Division 26 for electrical requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For laboratory casework.
1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations and types of service fittings.
6. Include details of support framing system.
7. Include details of exposed conduits, if required, for service fittings.
8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and laboratory equipment.
9. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

D. Samples: For casework finishes and materials requiring color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Test Reports:
   1. Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.
   2. Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface material with requirements specified for chemical and physical resistance.

1.5 DEFINITIONS

A. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches (1200 mm) above floor, and visible surfaces in open cabinets or behind glass doors.

C. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases 78 inches (1980 mm) or more above floor and bottoms of cabinets more than 24 inches (600 mm) but less than 48 inches (1200 mm) above floor are defined as "semiexposed."

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.7 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of laboratory equipment.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 W.

1.9 PERFORMANCE REQUIREMENTS

A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
   1. Support Framing System: 600 lb/ft. (900 kg/m).
   2. Suspended Base Cabinets (Internal Load): 160 lb/ft. (240 kg/m).
   3. Work Surfaces (Including Tops of Suspended Base Cabinets): 160 lb/ft. (240 kg/m).
   4. Wall Cabinets (Upper Cabinets): 160 lb/ft. (240 kg/m).

5. Shelves: 40 lb/sq. ft. (200 kg/sq. m).

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet-work are complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
1. Basis of design manufacturer is Leonard Peterson to establish standard of quality.
2. Equivalent products by other manufacturers may also be acceptable provided they meet the requirements of Contract Documents and are approved by the Architect.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

2.2 CASEWORK, GENERAL

A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."

B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.

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.

2.3 WOOD CASEWORK

A. Wood Laboratory Casework :
1. Design: Reveal overlay with square edges, unless otherwise indicated.
2. Provide 1/8-inch (3.2-mm) reveals between doors and drawers that are adjacent.

3. Wood Species and Finish: As indicated on Drawings.
4. Grain Direction:
   a. Doors: Vertical with continuous vertical matching.
   b. Drawer Fronts: Vertical with continuous vertical matching.
   c. Face Frame Members: Lengthwise.
   d. End Panels: Vertical.
   e. Bottoms and Tops of Units: Side to side.
   f. Knee Space Panels: Vertical.
   g. Aprons: Horizontal.
5. Acceptable product and manufacturer: As indicated on Drawings.

B. Exposed Materials:
1. Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Plywood: Hardwood plywood, either veneer core or particleboard core with face veneer of species indicated. Grade A exposed faces, at least 1/50 inch (0.5 mm) thick, and Grade J crossbands. Provide backs of same species as faces.
3. Solid Wood: Clear hardwood lumber of species indicated.
4. Edgebanding: Manufacturer's standard PVC.

C. Semiexposed Materials:
1. Wood: Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.

D. Concealed Materials:
1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

E. Wood Cabinet Materials:
1. General: Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
2. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
3. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
4. Particleboard: ANSI A208.1, Grade M-2.
5. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
6. Hardboard: ANSI A135.4, Class 1 tempered.
7. PVC Edgebanding for Wood: Rigid PVC extrusions, through color with satin finish, 3.0 mm thick at doors and drawer fronts, 1.0 mm thick elsewhere.

2.4 AUXILIARY CABINET MATERIALS

A. Acid Storage-Cabinet Lining: 1/4-inch- (6-mm-) thick, polyethylene, polypropylene, epoxy, or phenolic-composite lining material.

2.5 CABINET HARDWARE

A. Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

2.6 COUNTERTOP AND SINK MATERIALS

A. Epoxy Resin (ERC):
   1. Description: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
   2. Physical Properties:
      a. Flexural Strength: Not less than 10,000 psi (70 MPa).
      b. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).
      c. Hardness (Rockwell M): Not less than 100.
      d. Water Absorption (24 Hours): Not more than 0.02 percent.
      e. Heat Distortion Point: Not less than 260 deg F (127 deg C).
   3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
      a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
      b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).
   4. Color: As indicated on Drawings.
   5. Acceptable product: Equivalent to Kemresin by Kewaunee.

2.7 WOOD CABINET FABRICATION

A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W.
   1. General: Comply with dimensions on shop drawings.
   2. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch- (19-mm-) thick, hardwood plywood.
   3. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1-inch- (25-mm-) thick, veneer-core hardwood plywood.
   4. Ends of Cabinets: 3/4-inch- (19-mm-) thick, hardwood plywood.
   5. Shelves: 1-inch- (25-mm-) thick, veneer-core hardwood plywood.

B. Tables: Solid-hardwood legs, not less than 2 inches (50 mm) square with solid-hardwood stretchers as needed to comply with product standard. Bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device at bottom of each leg.
   1. Leg Shoes: Black vinyl or rubber, open-bottom, slip-on type.

C. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.

D. Filler and Closure Panels: Provide where indicated and as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as adjacent exposed casework surfaces unless otherwise indicated.

2.8 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply stain to exposed and semiexposed surfaces as necessary to match approved Samples. Apply stain to produce a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.

C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
   1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test shall be no more than for Level 3 conditions.

2.9 COUNTERTOPS AND SINKS

A. Countertops:
   1. Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch (25 mm).
   2. Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.

B. Sinks: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
   1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2 (DN 40), unless otherwise indicated.
   2. Overflows: Where indicated, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches (50 mm) less than sink depth. Provide in same material as strainer.

2.10 LABORATORY ACCESSORIES

A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.

B. Burette Rods: Aluminum or stainless steel rods, 1/2 inch (13 mm) in diameter and 18 inches (450 mm) long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.

C. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and one horizontal crossbar, 3/4 inch (19 mm) in diameter and 36 inches (900 mm) long unless otherwise indicated; two flush socket receptacles and two crossbar clamps. Ends of vertical rods are tapered to fit receptacles; other rod ends are rounded.

D. Greenlaw Arm Assembly: Aluminum or stainless steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.

E. Lattice Assembly: Aluminum or stainless steel, vertical and horizontal rod lattice assembly with 3/4-inch- (19-mm-) diameter rods at approximately 12 inches (300 mm) o.c. with two flush socket receptacles for mounting.
   1. Size: [**36 inches (900 mm)**] [**48 inches (1200 mm)**] wide by [**24 inches (600 mm)**] [**36 inches (900 mm)**] high.

F. Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless steel drip troughs with drain outlet.

2.11 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Service Fittings: Provide units that comply with SEFA 7, "Recommended Practices for Fixtures." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
   1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

B. Materials: Fabricated from cast or forged red brass unless otherwise indicated.

C. Finish: As selected by Architect from manufacturer’s full range.

D. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).

E. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than 5 lbf (22 N) to operate. Provide units designed for working pressure up to 75 psig (520 kPa), with serrated outlets.

F. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig (280 kPa), with serrated outlets.

G. Steam Valves: Stainless steel seat and PTFE seat disc. Provide units designed for steam working pressure up to 20 psig (140 kPa), with serrated outlets.

H. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.

I. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."

J. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

K. Handles: As selected by Architect; meeting the requirements of ADA.

L. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION OF CASEWORK

A. Comply with installation requirements in SEFA 2. Install level, plumb, and true in line; shim as required using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
   2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
   3. Variation of Faces of Casework from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
   4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches (600 mm) o.c. and at sides of cabinets with not less than two fasteners per side.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches (400 mm) o.c.

E. Install hardware uniformly and precisely.

F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2. Abut top and edge surfaces true in plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints where indicated on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.
   1. Countertops: Secure field-made joints using concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:
   1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
   2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches (1200 mm) o.c.
   3. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide holes and cutouts required for service fittings.

E. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

F. Dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.

B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports, stainless steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

D.

3.6 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.

B. Install fittings according to Shop Drawings, installation requirements in SEFA 2, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

END OF SECTION

SECTION 14 2100

ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Machine room-less electric traction elevator systems.

B. Coordination Requirement: Elevator controls, signals, signage and cab finishes shall be the same for all elevators within the Project.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete, elevator pit, including sump with pump, block-outs in machine room floor slabs, and other similar concrete work.

B. Division 04 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.

C. Division 05 Structural steel work, including intermediate floor framing where floor height exceeds 14 feet.

D. Division 05 Section “Metal Fabrications” for
   1. Attachment plates and angle brackets for supporting guide-rail brackets.
   2. Machine beams.
   3. Divider beams.
   4. Hoist beams.
   5. Structural-steel shapes for subsills.
   6. Pit ladders.
   7. Cants in hoistways made from steel sheet.
   8. Machine room floor grate.

E. Division 26 for communications and alarm systems for fire and life safety systems and electrical provisions, including fused disconnect switches for elevator system, service to control panels, hoistway outlets, pit outlets, lights and electric service.

F. Division 28 Section "Access Control" for security access system equipment used to restrict elevator use.

G. Division 28 Section "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.3 ACTION SUBMITTALS

A. Professional Certification: Provide Shop Drawings and engineering calculations prepared and sealed by elevator manufacturer as the elevator designer of record.

B. Professional Certification: Provide Shop Drawings and engineering calculations prepared and sealed by elevator manufacturer as the elevator designer of record.

C. Product Data:
1. Submit for elevator system, including capacities, sizes, performances, operations, safety features, finishes and similar information.
2. List and describe features of control systems.
3. Include environmental limitations for each item or component part.
4. Include catalog cuts for manufacturer's standard signal and operating fixtures, operating panels, indicators and other similar components.
5. Submit manufacturer's specifications and installation instructions for acoustic isolation pads, including load and deflection curves.

D. Shop Drawings:
1. Submit Shop Drawings showing plans, elevations, sections and details of elevator system.
2. Include reference to Work of related trades and details at adjacent construction.
3. Indicate:
   a. Sections of elevator shaft.
   b. Plan of elevator machine showing location and sizes of equipment and required clearances.
   c. Locations of equipment, including safety guards.
   d. Complete wiring and single line diagrams of system circuits and controls, showing electrical connections, functions, components, and sequence of operation of all apparatus connected with elevator system.
   e. Detailed drawings of elevator cab and hoistway entrances, including elevations, floor plans, reflected ceiling plans and complete details of doors, frames, controls, fixtures and accessory equipment.
   f. Rail bracket spacing and maximum loads on guide rails.
   g. Reactions at points of support.
   h. Weights of principal components.
   i. Loads on hoisting beams.
   j. Expected heat dissipation of elevator equipment.
   k. Power configuration data, including horsepower, voltage and amperage requirements, starting current, full load running current and demand factor for applicable motors. Include maximum and average power demands.
   l. Variations from specified requirements.
4. Include details of access control system provisions.

E. Samples:
1. Manufacturer's samples: Submit full range of standard color, texture and finish samples for final selection by Architect.
2. Sample sets:
   a. Following selections, submit samples for each type of exposed cab, hoistway entrance and signal finish showing color, texture and finish expected in completed Work.

b. Samples shall be minimum 12 inch long for running trim and 12 inch square for sheet or panels.

3. Maintenance Data: Provide written information necessary for proper maintenance, safety tests and adjustment of the equipment prior to final acceptance as follows:
   a. Straight line wiring diagrams of as-installed elevator circuits with index of location and function of all components. Wiring diagrams must be Project specific including serial numbers of primary components.
      Provide 4 corrected sets for Owner's file 60 days after acceptance. One (1) set shall be permanently mounted in elevator control room(s) and two (2) sets on acceptable electronic media.
   b. Three (3) copies of lubricating instructions and recommended lubricant grade.
   c. Three (3) Project specific parts catalogs and maintenance manuals. Six (6) sets of elevator keys identified for function and feature.
   d. Include any special tools, passwords, fault codes, fault code solutions, software packages or manuals that are required for maintenance, troubleshooting, adjustments or performing safety tests of the installed elevators for the Owner's use. Owner shall not incur additional cost for service tool or devices.
   e. If the Contractor requires the Owner to sign a lease for the special trouble-shooting tool, a copy of the lease shall be submitted with the bid for the Owner's consideration.
   f. Provide a minimum of two (2) hours of onsite Owner's training in the safe use of the elevator systems and Owner's data outlined in 1.3E.3. Training shall be accomplished by supervisory level personnel.
   g. Demonstrate the ability to use nonproprietary means to adjust, troubleshoot and perform Code required Safety tests as outlined in 1.3E.3.d.
   h. The Contractor shall comply with the provisions of the Buy American Act (41 U.S.C. § 10a), including, but not limited to, the purchase of steel.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:
   1. Submit manufacturer's certification that elevator system provided is compatible with requirements of Final Contract Documents in the following respects:
      a. Hoistway, pit and machine dimensions and clearances are adequate.
      b. Electrical service and emergency generator as designed are suitable for elevator equipment provided.
   2. Submit certification of fire retardant treatment for wood materials within elevator cabs stating name of fire retardant salts used, compliance with requirements of authorities having jurisdiction, compliance with AWPA standards, and stating that fire retardant treatment will not bleed through or otherwise adversely affect specified finish.
   3. Submit inspection certificates and operating permits required by governing authorities.

B. Qualification Data: Submit installer qualifications verifying years of experience and approval of manufacturer; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:
   1. Submit operation, cleaning and maintenance data for materials and systems provided.

2. Include description of elevator system method of operation and control, including door operation, signals, fire fighter's service, emergency power operation, and other special or non-standard features provided.
3. Provide parts catalogs with complete list of equipment replacement parts with equipment description and identifying numbers.
4. Provide legible schematic wiring diagrams covering electrical equipment installed, including changes made in final Work, with symbols listed corresponding to identity or markings on both machine and hoistway apparatus.
5. Provide following maintenance details:
   a. Lubrication chart.
   b. Trouble shooting procedures.
   c. Adjustment techniques.
   d. Operating checks.
6. Include copy of submittal in Project information manual.

1.6 DEFINITIONS

A. Terms used within specification Sections related to elevators are defined in ASME A17.1.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Service Elevator: A passenger elevator that is also used to carry freight.

1.7 SYSTEM REQUIREMENTS

A. Design Requirements:
1. Contract Documents are intended to cover complete installation of elevator systems and to broadly outline performance requirements, features, equipment, material selections, fabrication methods and installation procedures.
2. Contractor is responsible for design, engineering and detailing of systems as required to fulfill performance criteria and comply with requirements of authorities having jurisdiction.

B. Performance Requirements:
1. Speed: ± 5% under loading conditions.
2. Leveling: ± 1/4 inch under any loading condition.

C. Fire Resistance Requirements:
1. Protect wiring with flame retardant and moisture proof outer covering, and run in conduit, tubing or electrical wireways.
2. Treat wood components of elevator cabs with fire retardant treatment conforming to requirements of authorities having jurisdiction and AWPA Standards C20 for lumber and C27 for plywood for pressure impregnation with fire retardant chemicals to achieve flame spread rating of 25 or less in accordance with ASTM E84.

D. Electric Wiring Requirements:
1. Wiring and electrical interconnections shall comply with governing codes.

2. Provide wiring and required raceways between components furnished for elevator Work.

E. Acoustic Requirements: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure and minimize noise from elevator system.

F. Interface With Other Systems:
1. Coordinate elevator Work with Work of other trades and provide items to be placed during installation of other Work at proper time so as to avoid delays in overall Work.
2. Place such items, including inserts and anchors, accurately in relation to final locations of elevator components.
3. Use Contractor's bench marks.
4. Access control system:
   a. Coordinate elevator systems with requirements of Owner's separate security system contractor.
   b. Provide necessary installation provisions, including materials and assistance, as required for coordination and proper operation of completed systems.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Elevator Contractor must be able to demonstrate that he has installed and maintained similar elevators to those specified and which have given satisfactory service; has been in successful operation for at least ten (10) years; maintains locally an adequate stock of parts for replacement or emergency purposes; has available qualified persons to do the work.

B. Maintenance Personnel Qualifications: Employees of elevator installer.

C. The controls shall not have any software embedded that shuts the elevator down if the equipment is not malfunctioning and forces the Owner to call the Manufacturer for service.

D. Elevator Contractor shall collaborate with Owner’s quality control program. Owner shall, through his designated representative(s), schedule periodic site visits to allow review of the work while in progress. Elevator Contractor shall facilitate these site visits and make available Contractor’s site superintendent, during Contractor’s normal working hours, for joint review of the work. Elevator Contractor shall furnish to Owner, no later than five (5) days prior to site mobilization, a comprehensive installation schedule which includes tentative dates for the agreed milestones. Contractor shall provide periodic schedule updates as these milestones may change, so that Owner’s representative(s) may confirm date of site visit with at least ten (10) days advance notice. At a minimum, these site visits shall be conducted at the following milestones:
1. Commencement of installation of hoistway frames, prior to other subcontractor involvement
2. Completion of cab
3. Completion of DOB inspections
4. Other milestones, as may be agreed among the parties

E. Regulatory Requirements:
1. Comply with requirements of local authority having jurisdiction and any authority which may govern requirements for elevators.
2. Except as may be modified by governing authorities, comply with applicable requirements and provisions of the following:

a. ASME A17.1 "Safety Code for Elevators and Escalators".
b. ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People".
c. Uniform Federal Accessibility Standard (UFAS).

1.9 PARTS AND PRINTED CIRCUIT BOARDS

A. Contractor guarantees they will sell parts and printed circuit boards to the Owner and the Owner's Agent. The same shall not be dependent on an exchange component.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.11 PROJECT CONDITIONS

A. Verify dimensions of supporting structure at site by accurate field measurements so that elevator Work will be accurately fabricated and fitted to structure and that clearances and alignments are proper for installation of Work.

B. Provide for erection tolerances corresponding with specified tolerances for other Work where field measurements cannot be obtained.

C. Remedy unsatisfactory tolerances in adjoining Work.

1.12 WARRANTY

A. Provide warranty to replace, repair, or restore parts or components that fail or do not operate properly due to poor field or factory workmanship, engineering or design for a period 12 months from the date of substantial completion and signed final acceptance.

1.13 MAINTENANCE SERVICE

A. Initial Maintenance Service:
1. Maintain service of equipment for a period of 12 months after the date of final acceptance.
2. Examine monthly; clean, adjust, and lubricate equipment.
3. Repair or replace parts and accessories necessary to keep the equipment in peak operating condition whenever required. Use parts produced by the manufacturer of the original equipment.
4. Perform work without removing cars from service during peak traffic periods.
5. Provide emergency call-back service 24 hours a day, seven days a week with a maximum 2-hour response time for nonstandard hours and 1 hour for normal working hours and emergency entrapments.

6. Locally maintain adequate stock of parts for replacement or emergency purposes and have qualified installation personnel available to ensure fulfillment of this maintenance service without unreasonable loss of time.
7. Maintenance service shall be carried out only by the Elevator Contractor's personnel and shall not be assigned or transferred to another agent or subcontractor without prior written consent of Owner.

1.14 CONTINUING MAINTENANCE PROPOSAL

A. Elevator Contractor shall provide a continuing maintenance proposal in the form of a standard five-year maintenance agreement, starting from completion of the 12-month warranty maintenance period.

B. Proposal shall include 24-hour emergency callback service and response time for normal working hours, nonstandard hours and passenger entrapment. Proposal shall be submitted on manufacturer and installer's standard elevator maintenance agreement forms.

C. The maintenance proposal is to be submitted with equipment Bid for review.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers: Subject to compliance with requirements, provide Elevator products by one of the following:
1. Elevators
   a. Canton Elevator
   b. Collins Elevator Service, Inc.
   c. Delaware Elevator Company
   d. Elevator Control Service
   e. Minnesota Elevator Inc. (MEI Total Elevator Solutions)
   f. Quality Elevator Company
2. Dispatching Controllers
   a. Motion Control Engineering, Inc.
   b. Vantage Elevator Solutions (GAL Manufacturing/Hollister-Whitney)
   c. Smartrise Engineering, Inc.
3. Elevator Cabs and Hoistway Entrances
   a. Elevator companies listed in 2.1A.1 above.

2.2 ELEVATOR SCHEDULE

A. Elevator:
1. Rated load: As indicated on Drawings.
2. Rated speed: 200 fpm.
3. Floors served: As indicated on Drawings.
4. Stops and openings: As indicated on Drawings.
5. Power supply: 480 volt, 3 phase, 60 hertz.
6. Machine type and location:
   a. Gearless traction machine, for machine room-less system.

b. Controller location: As indicated on Drawings.
7. Control room: As indicated on Drawings.
8. Operation and Control: Microprocessor operation, VVVF control.
9. Hoistway entrances: As indicated on Drawings.
10. Cab size (inside dimensions): As indicated on Drawings.
11. Cab height: 8'-0 to canopy with 7'-4" clear at ceiling.
12. Cab doors: Same size as hoistway doors, single-speed center opening.
13. Home landing/Fire Floor: First Floor, unless otherwise required by Fire Marshall.
14. Additional features:
    a. Audible signals at landings and in cab.
    b. Anti-nuisance device to sound buzzer when door is propped open.
    c. Service cabinet.
    d. Intercom system.
    e. Access control service (key switch/card access).

2.3 PERFORMANCE

A. Speed: +/- 3% under any loading condition.

B. Capacity: Safely lower, stop and hold up to 125% rated load.

C. Leveling: +/- 1/8” under any loading condition.

D. Door Closing time, Thrust and Kinetic Energy shall comply with ASME Code and ADA. Door thrust shall not exceed 30 pounds.

E. Airborne noise: measured noise level of elevator equipment and its operations shall not exceed 50 dBA in the adjacent Lobby space(s) and 60 dBA inside cab at full contract speed with the exhaust fan on its highest speed.
1. Provide effective sound isolation between machines, secondary deflector sheaves, and solid state drive units and filters, from building structure to reduce noise transmission to occupied spaces and elevators and elevator cabs. When operating under any condition per plans and specifications, including car start or stop, door operation, and car movement, the elevator equipment shall not generate noise levels in excess of NC-35 in tenant spaces and shall be free of pure tones.

   For the purposes of this specification, a pure tone shall be defined as a sound level in any one-third octave band which is greater than 5 dB above both adjacent one-third octave bands, in the range 45 to 11,200 Hz. Provide the following as a minimum:
2. Support secondary deflector sheaves integrally from the unitized elevator base.
3. Resiliently isolate the entire elevator/secondary deflector integral unitized base from the elevator machine room floor slab by means of effective neoprene in shear isolators having a minimum static deflection of 3/8".
4. Isolate the transformers and reactance units from the building structure by means of approved neoprene-in-shear isolators having a minimum static deflection of 3/8".
5. Isolate the hitch plates to the elevator cab by means of an elastomeric pad in compression designed to provide 1/8" deflection under dynamic loading.
6. Solid state rectification units shall be mounted on ¾" thick minimum, neoprene-in-shear pad isolators and an effective electrical filter/reactance limiting electrical noise shall be provided.

7. Conduits and electrical connections shall not be fastened to or supported by elevator machinery or solid state rectification units, except by approved flexible connections.

F. Vibration Control: all elevator equipment including but not limited to power units, hoist machines and controller cabinets shall be mechanically isolated from the building structure and electrically isolated to minimize the objectionable noise and vibration transmission to occupied spaces of the building.

G. Machine room noise levels not to exceed 80 dBA for elevator equipment.

H. Ride Quality: Adjacent peak-to-peak acceleration: 200 FPM – 17 mg; 1-10 Hz range; Sustained Jerk-not more than 6 feet/second.

I. Floor to Floor Performance Time: Floor to Floor performance time [typical floor] of 10.5 seconds (from time door starts closing at one floor to fully opened and level on next successive typical floor, regardless of loading conditions or direction of travel).

2.4 EQUIPMENT

A. Identification: Provide identifying numbers on hoist machine, governor, controller and all associated electrical switches and panels.

B. Motors, Controller, Controls, Buttons, Wiring, Devices, and Indicators: UL approved.

C. Guide Rails, Ropes, Cables, Counterweights, Sheaves, Buffers, Attachment Brackets and Supports, and Anchors: Designed and sized according to code with applicable safety factors.

D. Coated Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords.

E. Controllers:
1. Provide microprocessor-based control system with software suitable for intended building occupancy to perform car operational control and hardware necessary to connect, transfer and interrupt power and protect motor against overloading.
2. Properly shield controller cabinet containing memory equipment from line pollution.
3. Design and test controller for electromagnetic interference (EMI) immunity.
4. Equip controller with the following filters and gaskets to reduce EMI emissions to levels that comply with EN 12015 “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 1 – Emission”:
    1) Current harmonic filter.
    2) Anti-pollution device.
    3) Single phase filter.
    4) Current controlled choke
    5) Conductive fabric over foam gaskets.
5. Design microprocessor system to accept re-programming with minimum down time.

F. Elevator Machines:
1. Gearless permanent magnet traction machine: AC gearless machine, with synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.
2. Machine shall be provided with a steel bed plate and beams for mounting.

3. Governor: Tension-type governor.
4. Variable-voltage, variable-frequency AC-type hoisting machine.
   a. Reversible motor with high starting torque and low starting current designed to withstand severe loads encountered in elevator service; rated for 30 minutes, conforming to NEMA standards.
   b. Motor armature shall be dynamically balanced and supported by appropriate ball or roller bearings.
   c. Provide Class A insulation for 50 deg C rise.
   d. Provide sufficient capacity to operate with contract load at contract speed.
   e. Provide motor starting controls such that under no circumstances shall motor starting current exceed 3.0 times motor full load current.
   f. Voltage control:
      1) Provide elevator manufacturer's solid-state power converters.
      2) Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

G. Brake: The brake shall be spring applied and electrically released and designed to provide smooth stops under variable loads. Include unintended upward movement device per ASME A17.1.

H. Sound Isolation: Provide resilient isolators, equal to Mason Industries, beneath the machine bed plates and drive units to reduce vibration and noise transmission and vibration to the building structure.

I. Governor: The car safety shall be operated by a centrifugal speed governor located at the top of the hoistway. The governor shall actuate a switch when excessive descending speeds occur, disconnecting power to the motor and applying the brake application of the safety. Provide a remote reset type governor actuated from the controller.

J. Drive System:
1. A variable voltage variable frequency AC drive system shall be provided. Power for the system will be taken from the building 3 phase power supply. The AC voltage will be changed to DC, and a power transistor inverter circuit will change the DC voltage to AC to power the elevator motor. Motor speed and torque will be controlled by varying the frequency and amplitude of the AC. A digital velocity encoder shall be provided on the motor giving feedback to the controller on motor speed and position. Provide line filters, noise spike or notching suppressors to insure other computer-operated equipment in the building will not be affected.
2. The system shall meet or exceed all requirements of IEEE 519 current standard for general systems. The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slowdown points in memory.
3. The drive control system shall be a dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit accurate position/velocity feedback shall permit a fast and accurate control of acceleration and deceleration. The vertical acceleration rate shall be not less than 3.3 ft./sec.^{2} for speeds through 700 fpm, and 4 ft./sec.^{2} for speeds over 700 fpm.

2.5 AUTOMATIC TWO WAY LEVELING

A. Each elevator will have two-way leveling to automatically bring the car to a stop approximately level with any floor for which a stop has been initiated, regardless of load, rope stretch of direction of travel.

B. Automatic leveling control shall permit the synchronization of door opening with the stopping of the car at a floor.

2.6 ELEVATOR SUCCESSIVE STARTING

A. After all variable frequency drives in a group have been shut down due to lack of normal power, only a single drive shall be allowed to start up at one time in sequence.

2.7 NORMAL STOPPING DEVICES

A. Provide slow-down and normal stopping devices on top of each car.

2.8 GUARDS

A. In addition to guards for sheaves and other similar items hereinafter specified, attention is directed to the requirements relative to guarding of exposed gears, sprockets, tape or rope sheaves, or devices of selectors, floor controllers, or signal machines, and the ropes, chains, or tapes for driving same in machine rooms and secondary spaces. Kick angles shall be included around all unprotected openings in the machine room floor.

2.9 MOTION CONTROL

A. Furnish and install microprocessor motion controllers for each elevator.

B. The motion control system shall perform all of the functions of safe elevator motion and elevator door control. This shall include all of the hardware and software required to connect, transfer and interrupt power, and protect the equipment against overloads. The motion controller shall interface with the microprocessor control system.

2.10 OPERATION AND CONTROL SYSTEMS

A. Provide “Simplex” operation and control systems for each group of elevators as scheduled.

2.11 COMPONENTS

A. Car:
   1. Frame and platform:
      a. Construct frame of structural or formed steel members.
      b. Construct platform of steel reinforcing with steel plate.
      c. Mount platform on resilient pads.
      d. Finish flooring: **ARCHITECT TO PROVIDE**
   2. Shells:
      a. Fabricate from manufacturer's standard gage sheet steel for walls and canopy, suitably reinforced for rigidity and cut out for accessories and panels.

b. Make joints between panels vertical, flush, even and light tight.
c. Provide vents at bottom of panels.
d. Provide sound deadening at backs of panels.
e. Provide black finish on panel recesses and corner straps.
f. Reinforce canopy/ceiling construction as necessary to maintain loads applied during car top inspection.
g. Provide car top emergency and inspection hatches as required by code.
h. Provide side emergency access panels as required by code.
i. Provide car top railings as required by code.

3. Finish Cab Panels and Ceiling
   a. Cab wall panels: Plastic laminate panels. Cab ceiling to be #4 stainless steel panels with recessed LED downlights.
   b. Cab railing to be stainless steel.
4. Door panels:
   a. Flush hollow metal construction, minimum 16 gage sheet steel, sound deadened, minimum 1 inch thickness; stainless steel clad finish.
   b. Reinforce by continuous vertical reinforcing as required for adequate support and surface flatness for configurations indicated.
   c. Provide each door panel with 2 accurately machined guides of design that will permit replacement without removal of doors.
5. Return panels:
   a. Front return walls: 16 gage stainless steel, satin finish.
   b. Fixed configuration, suitably reinforced as required for surface flatness and support of equipment cutouts.
   c. Incorporate operating controls, control panel, signals, required signage, certificate holder, telephone cabinets and other features as required, indicated or specified.
   d. Finish: Stainless steel.
6. Sills: Extruded aluminum.
7. Ventilation:
   a. Provide exhaust unit with 2-speed operation.
   b. Furnish suitable isolation mountings and sound insulation to provide quiet operation.
8. Emergency lighting: Furnish one emergency light in cab; manufacturer's standard, unless otherwise specified.
9. Telephone and cabinet:
   a. Provide cabinet for cab; in front return.
   b. Provide phone for emergency communications, connected to Owner’s security vendor’s office for 24-hour monitoring, as required to comply with authorities having jurisdiction and with requirements of UFAS. Provide telephone with the following features:
      1) Battery back-up system.
      2) Internal speaker and microphone, for use without handset. Mount speaker button 4'-0" maximum above car floor.
      3) Emergency communication system shall not require voice communication. At a minimum, provide both audio and visual indication that call has been answered.
      4) Field-programmable auto-dial memory and location identification signal device, activated by push button which illuminates when call is answered.
      5) Raised tactile lettering in panel, reading "EMERGENCY USE ONLY", and providing instructions for use in both English and Braille.

B. Hoistway Entrances:
   1. Fire rating:
      a. Fabricate assemblies as tested and approved by Underwriters' Laboratories or other nationally recognized testing agency approved by authorities having jurisdiction.
      b. Comply with requirements of NFPA 80.
      c. Comply with requirements of ASTM E152, NFPA 252m or UL 10B.
   2. Identify each assembly with factory applied label indicating applicable fire rating.
   3. Doors:
      a. Fabricate doors of flush hollow metal construction, minimum 16 gage sheet steel; minimum 1-1/4 inch thick, stainless steel clad.
      b. Reinforce by continuous vertical reinforcing as required for adequate support and surface flatness for configurations indicated.
      c. Provide sight guards formed of minimum 16 gauge steel, finish to match exposed door finish.
      d. Provide hoistway access escutcheons or devices on all hoistway doors.
   4. Frames:
      a. Fabricate frames of hollow metal construction, minimum 14 gage sheet steel with sound deadening material applied to back surface, clad frames with stainless steel.
      b. Provide sizes and profiles indicated on Drawings.
   5. Sills: Extruded nickel silver; manufacturer's standard profile.

C. Hoistway and Cab Door Operators:
   1. General:
      a. Provide adjustable heavy-duty electric operators designed to smoothly open and close cab and hoistway doors simultaneously.
      b. Standing time:
         1) Normal time doors remain open after stopping for demand: Separately adjustable for car calls and landing calls, and capable of adjustment from minimum of 3 seconds to 30 seconds after doors reach fully open position.
         2) Initial adjustment: Set to minimum time equal to distance/1.5 feet per second for car call and 5.0 seconds for landing call.
   2. Door safety devices:
      a. Provide safety device with uniform array of 36 or more microprocessor-controlled infrared light beams projecting across car entrance. Interruption of one or more beams shall cause doors to stop and re-open.
      b. Include audible warning signal and nudging feature which will slowly close doors held open for extended period of time.

D. Electrical Components:
   1. Fittings: Steel compression type for electrical metallic tubing; fittings with set screws are acceptable only when separate grounding conductor is installed across joint.
   2. Do not parallel conductors to increase current carrying capacity unless individually fused.
   3. Do not use armored flexible metal conduit as grounding conductor.
   4. Provide additional disconnect switches and wiring to suit machine layout.
   5. Include wiring and connections to elevator devices remote from hoistway.

2.12 MATERIALS

A. Carbon Steel: ASTM A1008, cold rolled, commercial quality sheet steel, free from scale, pitting or other defects; matte finish and stretcher leveled.

B. Stainless Steel:
1. Plate, sheet and strip: ASTM A666.
2. Bars and shapes: ASTM A276.
3. Tubing: ASTM A269.
4. Castings: ASTM A297, iron-chromium-nickel.
5. Provide Type 304, unless otherwise recommended by fabricator for conditions of application or required to match Architect's sample.

C. Panel Materials:
1. Plastic laminate: High pressure laminates, complying with NEMA LD3 and AWS Ed. 2, Section 4 Sheet Products. Provide the following grades:
   a. Exposed vertical surfaces: VGS, nominal 0.028 inch (.71 mm) thick.
2. Panel core material:
   a. Mat-formed wood particleboard, medium density, complying with AWI 200-G-3.
   b. Fire retardant treat panel cores as specified under “Fire Resistance Requirements” above.

D. Protection Pads and Buttons: Provide at all elevators:
1. Type: Flame resistant fabric and filling with sufficient stitching to prevent sagging of filling.
2. Attachment devices: Manufacturer's standard stainless steel buttons and grommets.
3. Cutouts: Provide cutouts for control stations and other signal devices.

2.13 SHOP FINISHES

A. Carbon Steel:
1. Finish: Manufacturer's standard factory baked enamel finish.
2. Color: To be selected by Architect from manufacturer’s full standard color range.

B. Stainless Steel:
1. Mechanical finishes are designated with NAAMM nomenclature.
2. Finish: No. 4, satin, directional polish.
3. Apply directional finishes in long direction of each component.

2.14 FINISH SCHEDULE

A. Hoistway Entrances:
1. Doors and Frames: Stainless Steel, No. 4 finish.

B. Cab:
1. Doors: Stainless steel, No. 4 finish.
2. Return panels: Stainless steel cladding, No. 4 finish.
3. Side panels: Stainless steel, No. 4 finish.
4. Rear panels: Stainless steel, No. 4 finish.
5. Canopy: Brushed stainless steel panels with recessed LED downlights.
6. Base: Brushed stainless steel.
7. Flooring: As noted on Drawings.
8. Handrails:
   a. Stainless steel; 1-1/2 x 1 inch, with closed ends.
   b. Provide for both side walls.

2.15 CONTROLS, SIGNALS AND SIGNAGE

A. Cab Controls and Signals:
   1. Car operating panel in front return:
      a. Incorporate car operating controls, control panel, signals, signage, certificate holder, telephone cabinets, and other features.
      b. Provide one operating panel, in front return.
      c. Buttons:
         1) Flush stainless steel buttons of vandal-resistant design, of minimum 3/4 inch diameter, corresponding to each landing served, "door open" and "door close", with illuminated center plastic bezel.
         2) When pressed, buttons illuminate and remain illuminated until call is answered.
      d. Additional controls: Emergency call buttons, stop switch, fire department keyed switch, and independent service switch.
      e. Provide raised markings and Grade 2 braille to left of each button, in compliance with UFAS; markings and braille shall be black on stainless steel plate of same finish as front return panels.
      f. Conceal the following items in panel:
         1) Run/stop key switch, lighting, top-of-car inspection, and fan.
         2) GFI outlet.
      g. Provide connected handset for fire communication equipment in one telephone cabinet.
      h. Provide fully connected phone for emergency communications equipment in other telephone cabinet.
   2. Car position indicators:
      a. Digital LED type, with minimum 1/2 inch high numerals.
      b. Mount over car operating panel.
      c. As car passes each floor and as car stops at a floor, the corresponding numerals shall illuminate and an audible signal shall sound. Audible signal in car shall sound minimum of 5 seconds before doors open.

B. Hall Buttons:
   1. At each terminal landing, provide single push button.
   2. At each intermediate landing, provide button fixture containing "UP" and "DOWN" push buttons.
   3. Provide one hall button panel on each floor.
   4. Buttons:
      a. Flush stainless steel buttons of vandal-resistant design, of minimum 3/4 inch diameter, with illuminated center plastic bezel.
      b. When pressed, buttons illuminate and remain illuminated until call is answered.
   5. Provide raised markings and Grade 2 braille to left of each button, in compliance with ANSI and UFAS; markings and braille shall be black on stainless steel plate of same finish as call button plate.
   6. Configuration and finish:
      a. Mount in manufacturer's standard satin finish stainless steel plate.
      b. Incorporate key switch as specified above under “Fire Emergency Operation”, and card readers as specified below under “Access Control Operations”.

C. Hall Lanterns:

1. Direction lantern of vandal-resistant design, illuminating white for up and white for down, over each hoistway entrance. Secure using tamper-resistant screws.
2. Lantern illuminates indicating direction of travel.
3. Audible signal:
   a. Provide lantern with gong sound approximately four seconds before car door opening; once for up direction, twice for down direction.
   b. Equip gong with adjustable volume.
   c. Permit gong to sound in response to hall calls but not in response to car calls.
4. Faceplate material: Manufacturer's standard satin stainless steel.

D. Hall Car Position Indicators:
1. Integral digital or LED read-out type position indicator of vandal-resistant design, at First Floor only. Secure using tamper-resistant screws.
2. Provide floor designations and direction arrows.
3. Faceplate material: Manufacturer's standard satin stainless steel.
4. Provide separate vandal-resistant lantern with lights and chimes, in accordance with “Hall Lanterns” in paragraph above.

E. Emergency and Braille/Number Signage:
1. General: Provide as required by authorities having jurisdiction.
2. Emergency signage:
   a. Cabs: Text shall be engraved in stainless steel front return panel, with etched letters infilled with black enamel.
   b. Halls: Text shall be etched in satin stainless steel plate below hall buttons, with etched letters infilled with black enamel.
3. Cab braille/number signage: As specified above under "Cab Controls".
4. Hall braille/number signage: As specified above under "Hall Buttons".
5. Hoistway jamb braille/number plates:
   a. Provide combination braille/number plates on both sides of each hoistway entrance, to identify floor. Characters shall be at least 2 inches high.
   b. Permanently mount plates using adhesive, centered in frame width and 5'-0" to center of jamb plate above finish floor. Exposed fasteners are not acceptable.

2.16 FABRICATION

A. Fabricate and assemble various parts in shop to minimize field assembly.

B. Trial assemble parts which cannot be shop assembled and which require close field fit; mark for field erection.

C. Do not permit name plates or logos identifying manufacturer to be visible to general public.

D. Provide concealed fasteners on surfaces exposed to public view.

E. Factory finish components concealed from public view with manufacturer's standard finish systems.

2.17 ELEVATOR OPERATIONS

A. Fire Emergency Operation:

1. Provide in accordance with requirements of local authorities and ASME A17.1.
2. Connect elevator to auxiliary (isolated) contacts of smoke and heat sensing devices. When smoke is detected by elevator lobby devices or others, registered calls for elevator are canceled and car automatically returns to designated Fire Floor. If smoke is detected on Fire Floor, cars stop on floor above Fire Floor.
3. Fire Floor: Unless otherwise determined by Fire Marshall, provide as scheduled above.
4. Cab provisions: Provide three-position keyed switch in cab control panel to provide for fireman's access.
5. Hoistway entrance provisions:
   a. Provide three-position key switch at designated Fire Floor.
   b. Incorporate key switch into hall call button faceplate, unless otherwise required by Fire Marshall.
   c. Provide with manufacturer's standard, surface mounted key box (for key required to call or operate elevators); mount where directed by Fire Marshall.
   d. Match finish of key box with finish of hall call button plate. Engrave faceplate to read "EMERGENCY ONLY", and incorporate pictographs into faceplate.
6. Fire emergency control and operation must be approved by Fire Marshall prior to fabrication.

B. Emergency Power Operation:
1. Provide emergency power of same characteristics as normal power supply (by connection to building emergency generator system) capable of providing power for operation of car after loss of normal power.
2. Coordinate with emergency generator requirements, to verify that emergency generator has adequate capacity to handle emergency startup power.
3. Provide emergency power operation to satisfy requirements of fire emergency control under emergency power conditions.

C. Access Control System Operation - Card Reader Operation:
1. Location of card reader: Outside of elevator at each landing level.
2. General: As part of elevator operation and control, provide equipment and labor necessary to coordinate elevator control system with Owner's access control system. This elevator Work shall include, but not be limited to, the following:
   a. Provide shielded signal cabling and wiring from access control system termination strip cabinet to hall call buttons, and to car as required for operation of access control system via traveling cable.
      1) Provide quantity and gage of shielded cables and wires as required by Owner, including those required for supervision of signal lines.
      2) Provide access control system termination strip as part of elevator Work.
   b. Make provisions for installation of card reader near hall call buttons panel.
3. Operation: Owner's access control system will provide for automatic controlled use of elevator, on a 24 hour a day basis.

2.18 CONTROL/INDICATOR PANELS

A. Supervisory Control Panel:
1. Provide manufacturer's standard panel located in electrical control room.
2. Provide keyed override switch in electrical control room, to override access control system in the event of access control system failure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structure and conditions under which elevator Work will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that hoistway, pit, and equipment room comply with applicable standards and requirements of Contract Documents.

C. Review and approve structural tolerances, location of structural supports, miscellaneous metal fabrications, pit ladders, hoistway construction, heating, ventilating and air conditioning of equipment rooms; ventilating of hoistways; and electrical power, lighting and outlets required for elevator Work.

D. Verify that sill support angles are properly installed.

3.2 INSTALLATION

A. Install components of elevator system in accordance with final Shop Drawings, manufacturer's written instructions and requirements of ASME A17.1.

B. Install hoistway and control room components. Connect equipment to building utilities.

C. Provide conduit, boxes, wiring and accessories within control room, hoistway and signal outlets.

D. Welded Construction:
   1. Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts.
   2. Comply with AWS standards for workmanship and for qualifications of welding operators.

E. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

F. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

G. Alignment:
   1. Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car.
   2. Where possible, delay final adjustment of sills and doors until car is operable in shaft.
   3. Reduce clearances to minimum, safe, workable dimension at each landing.

H. Leveling Tolerance: 1/8 inch up or down, regardless of load and direction of travel.

I. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

J. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. Place hall lanterns beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing:
1. On completion of elevator installation and before permitting use (either temporary or permanent) of elevator, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
2. Test safety circuit, loop circuit, and the drive circuits at 500 volts. Minimum resistance to ground shall be one meg ohm.
3. Test security system and devices for proper operation.
4. General riding quality, leveling accuracy, and quietness of operation shall be acceptable to the Owner's representative.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

C. Test Results: In test conditions, ensure speed and performance times specified be met, leveling accuracy maintained without releveling, and general riding quality is acceptable to Owner.

D. Performance Adjustments:
1. Should tests uncover defects or poor workmanship, variance or noncompliance with requirements of specified codes and ordinances or variance or noncompliance with specified requirements, complete following Work and repairs at no additional expense to Owner.
2. Replace equipment that does not meet ASME A17.1 or specified requirements.
3. Perform Work and furnish materials and equipment necessary to complete specified operation and performance.
4. Perform retesting required by governing authority and Owner to verify specified operation or performance.

3.4 ADJUSTING

A. Balance car to equalize pressure of roller guide shoes on rails.

B. Adjust motors, pumps, valves, generators, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, safety devices and other components to achieve required performance levels.

C. Adjust car movement on aligned guide rails to provide smooth movement, with no perceptible lateral or oscillating movement or vibration.

3.5 CLEANING

A. Keep Work areas orderly and free from debris.

B. Remove loose materials and filings resulting from Work within hoistways.

C. Prior to field quality control testing and inspection:

1. Clean equipment and surrounding areas of dirt, oil and grease.
2. Remove temporary protection and clean pit, hoistway, car, cab enclosures and finishes, entrances and landing sills, hatch, operating and signal fixtures, and trim to remove dirt, oil, grease and finger marks.

3.6 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operation and daily maintenance of elevators.
   1. Review emergency provisions, including access and procedures to be followed in identifying sources of operational failures or malfunctions.
   2. Confer with Owner on requirements for a complete elevator maintenance program.
   3. Demonstrate coordination between elevator and emergency generator operations.
   4. Demonstrate operation of elevator access control system.

B. Check each elevator operation, with Owner's personnel present just prior to time of Substantial Completion. Determine that control system, operating components, and safety devices are functioning properly.

3.7 PROTECTION

A. At time of substantial completion of elevator Work, provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect elevator Work from damage or deterioration.

B. Maintain protective measures throughout remainder of construction period so that elevator systems and components will be without evidence of damage or use at time of acceptance.

3.8 ACCEPTANCE

A. Final acceptance of the installation shall be made only after all field inspections and tests are complete, punch list items are complete, all Owner’s information items listed in 1.02.C have been furnished, and the Owner’s representative is satisfied that the installation has been satisfactorily completed.

END OF SECTION

SECTION 281300

ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. The specification provides all necessary information to produce a complete proposal for a sophisticated, easy to-use, multi-tasking, multi-user Access Control System (ACS).

1. Security access central-control station.
2. One or more security access networked workstations.
3. Security access operating system and application software.
4. Security access controllers connected to high-speed electronic-data transmission network.

1.2 REFERENCES

A. National Fire Protection Association (NFPA): 70-2020 National Electrical Code The standard for the safe installation of electrical wiring and equipment in the united states.

B. Underwriters Laboratories, Inc. (UL): 294-7th Edition The standard of safety for access control system units

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans and details.

C. Contract Closeout Submittals:

1. Operators Manual: The operators manual shall fully explain all procedures and instructions for the operation of the system.

2. Hardware Manual: The manual shall describe all equipment furnished.

3. Software Manual: The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation.

4. Operators Manual: The operators manual shall fully explain all procedures and instructions for the operation of the system.

5. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

6. Operations and Maintenance Data:
   a. Manufacturer's maintenance recommendations.

7. As-Built Drawings: During system installation, maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the SMS to be used for record drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the SMS. Copies of the final as-built drawings shall be provided to the end user in PDF format.

1.4 QUALITY ASSURANCE

A. Providers of manufactured components, installation, wiring and testing shall be the responsibility of a single contractor who is an authorized dealer for the product supplied and who has been continuously in business for a period of not less than five (5) years, is licensed as required by the jurisdictions where the work will occur to perform the work specified, and is certified in NFPA 101.

B. Authorized RS2 dealer: The security firm shall be a RS2 dealer in good standing.

C. Technician Certification:
   1. Technical personnel shall be certified by the factory for the installation and service of all RS2 components.

D. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Credential card blanks, ready for printing. Include 100 credential cards.
   2. Key fob blanks. Include 100 key fobs.

1.6 WARRANTY

A. During the first year, provide a full service warranty program that guarantees a two to four hour on-site response, include all parts and labor, and provides advance replacements for any defective components. The installation contractor must qualify as the service organization and provide the on-site warranty service.

B. The system components shall be guaranteed against all defective materials, design and workmanship for a period of one-year from the date of acceptance by the client after final testing. New replacement parts shall be furnished promptly and defects in design and workmanship shall

be corrected, without cost to the Owner, promptly upon receipt of notice from the Owner of failure of any part of the system during the guarantee period.

C. The warranty period for any part which has a warranty by the manufacturer of longer than 12 months shall be for the longer period. Provide a copy of the manufacturer's warranty period statement for all alarm equipment, all software, all major components, and other major devices.

1.7 COMMISSIONING AND STARTUP

A. Supply training for personnel for data entry of cardholder information, badge printing and access level assignments. Contractor is not responsible for cardholder creation or badge production.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Access Control System: PC-based central station with centralized controller panels and door controllers connected via RS485 between closets or a LAN network where required.

B. All doors must have Door Position Switch (DPS) for access control as well as intrusion and a motion REX for 'door shunting' to curb 'door forced open alarms'.

2.2 MANUFACTURERS

A. Manufacturers of the products indicated as acceptable in subsequent paragraphs are as follows:

1. Access Control Solution: RS2 Technologies
2. Hardware: Mercury Security
3. Power Supplies: Altronix
4. Door Stations: Axis Communications
5. Card Readers and Credentials: Schlage

2.3 ACCESS CONTROL SOLUTION

A. Description: The District of Columbia Public Schools has adopted the Access It! suite of access control products by RS2 Technologies (www.rs2tech.com) coupled with hardware by Mercury Security (www.mercury-security.com).

B. RS2 Licensing: Provide Access It! Enterprise user access license, E-CLIENT: one (1) elementary schools, two (2) middle schools and education campuses, three (3) high schools.

C. All hardware related to the access control system shall be hard wired. Wireless equipment is not acceptable.

2.4 CARD READERS

A. Approved equipment: Schlage multi-technology readers. MT-11 mullion mount and MT-15 wall mount, as appropriate.

B. All exterior doors shall have card readers and integrated into the access control system.

2.5 CREDENTIAL CARDS

A. Approved equipment: Schlage aptiQ 8540 MIFARE DESFire Card (13.56MHz)—4Kbyte/32k bit memory/14443 ISO Graphic Quality Card (Encode with Custom Credentials).

B. Card readers to be programmed for custom DCPS key.

2.6 EXTERIOR DOOR STATIONS

A. Approved equipment:
1. AXIS A8004-VE
2. AXIS I8016-LVE
3. AXIS A8105-E for mullion installations.

2.7 INTERIOR DOOR PHONE

A. Approved equipment: Grandstream GXV3370.

B. Description: Three (3) phones are to be provided.
1. One (1) phone located at main entrance/security and shall be able to remotely unlock the main entrance door.
2. One (1) phone located at main office (shall not be able to remotely unlock the main entrance door.
3.
4. One (1) phone located at the loading dock (shall not be able to remotely unlock any door)

2.8 IP PBX

A. IP PBX shall be a Grandstream UCM6202.

2.9 SECURITY EQUIPMENT ENCLOSURES

A. Description: All enclosures shall be provided with a key-lockable door and all doors shall be keyed alike. All enclosures shall include a tamper switch for direct supervision of the cabinet door. Cabinet openings shall initiate an alarm condition to the security monitoring system. Hinged NEMA 1 cover enclosures shall be used for indoors application and weatherproof NEMA 4X enclosures shall be used for all outdoor applications. All enclosures shall be UL listed and approved.

B. Tamper switches shall be wired as to report separate alarms to the system for each panel; daisy chaining tamper switches is not allowed.

C. Approved equipment: Altronix Trove 1, Trove 2, or Trove 3, as appropriate, with Altronix/Mercury backplane.

2.10 POWER SUPPLIES—ACCESS CONTROL PANELS

A. Description: The low voltage power supply shall convert a 115 VAC 60 Hz input to a continuously supplied current of 24 VDC. The power supply shall be UL listed, NFPA compliant, and have multiple class 2 rated outputs.

B. Maintenance free batteries shall be provided with all power supplies for locking hardware. Batteries shall be sized to allow at least 12 hours of power backup. All power supplies shall be monitored for A/C power failure and low battery failure through the access control system by wiring to available power failure inputs and auxiliary inputs.

C. All power supplies shall be installed with means of disconnect from line power. The preferable method of disconnect is through a dedicated electrical panel circuit breaker. The panel number and circuit number shall be labeled on the inside door of the of each respectively.

D. Power supplies shall to be tied into Fire alarm where needed for emergency egress as per NFPA 101 code requirements using onboard FACP inputs.

E. Approved equipment: Altronix eFlow 4NB, eFlow 6NB, eFlow102NB, eFlow104NB, as appropriate.

2.11 POWER SUPPLIES—DOOR LOCKING HARDWARE

A. Description: The low voltage power supply shall convert a 115 VAC 60 Hz input to a continuously supplied current of 24 VDC. The power supply shall be UL listed, NFPA compliant, and have multiple class 2 rated outputs.

B. Maintenance free batteries shall be provided with all power supplies for locking hardware. Batteries shall be sized to allow at least 12 hours of power backup. All power supplies shall be monitored for A/C power failure and low battery failure through the access control system by wiring to available power failure inputs and auxiliary inputs.

C. All power supplies shall be installed with means of disconnect from line power. The preferable method of disconnect is through a dedicated electrical panel circuit breaker. The panel number and circuit number shall be labeled on the inside door of the of each respectively.

D. Power supplies shall to be tied into Fire alarm where needed for emergency egress as per NFPA 101 code requirements using onboard FACP inputs.

E. Approved equipment: Altronix eFlow 4NB, eFlow 6NB, eFlow102NB, eFlow104NB, as appropriate.

2.12 POWER MANAGEMENT MODULES

A. Power Management module for Mercury Panels shall be Altronix LINQ8PD / LING2.

B. Power Management module for locks shall be Altronix LINQ8ACM or LINQ8ACMCB, as appropriate.

2.13 CABLES

A. Contractor shall provide all conduits and pathways from head end equipment to door locations. The only approved method for running security wiring is compete conduit runs from security devices to security panels.

B. All access control cables shall be composite cables.

C. All access control cables shall be plenum rated if not in conduit.

D. Approved products: Belden composite or Banana Peel access control cable, Windy City composite, Genesis composite cable, or equivalent.

2.14 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.15 ACCESS CONTROL HARDWARE MOUNTING STAINLESS STEEL BOLLARDS

A. Where shown on drawings or required by design furnish a brushed stainless steel bollard to mount card readers, door stations, cameras, intercoms, keypads, entry/exit buttons, biometric readers, and other access control devices.

B. Pedestal must be appropriately sized by height. Door phones shall be installed a minimum 54” from floor surface. Other devices shall be installed at 44”.

C. Approved products: Pedestal PRO ADA-SS-TWR-60x4x6

2.16 DOOR STATUS AND ANNUCIATION

A. Exit Alarm: Operation of a monitored door shall generate a status annunciation in the administrative office. Basis of design: Axis C1410 Network Mini Speaker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

E. Coordinate layout and installation of Access Control Systems equipment with Owner's security representative. To the extent possible, controller and power supplies should only be located in MDF and IDF rooms.

3.3 INSTALLATION

A. General: The contractor shall install all system components and appurtenances in accordance with manufacturers' instructions, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation. Provide mounting hardware as required.

B. Installation: All low voltage wiring outside the control console, cabinets, boxes, and similar enclosures, shall be plenum rated where required by code. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring.

C. Device Wiring and Communication Circuit Surge Protection: All inputs shall be protected against surges induced on device wiring. Outputs shall be protected against surges induced on control and device wiring installed outdoors, and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors, except fiber optics, which serve as communications circuits from security console to field equipment, and between field equipment, shall have surge protection circuits installed at each end.

3.4 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and fiber-optic rating of components, and that ensure Category 6 and fiber-optic performance of completed and linked signal paths, end to end.

C. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

D. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.5 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft.

E. Card Readers and Keypads:
   1. Install number of conductor pairs recommended by manufacturer for the functions specified.
   2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft.
   3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
   4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 18 AWG cable from controller to electrically powered locks. Do not exceed 250 ft.

G. Install minimum No. 18 AWG AC power wire from transformer to controller, with a maximum distance of 25 ft.

3.6 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

3.7 WIRING FIRESTOPPING

A. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

3.8 IDENTIFICATION

A. In addition to requirements in this article, comply with TIA/EIA 606-A.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
   2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

3.9 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.10 FIELD QUALITY CONTROL

A. The contractor shall perform pre-delivery testing, site testing, and adjustment of the completed access control system.

B. Tests and Inspections:
   1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-B.1, "Commercial

Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-B.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain access control system.

B. Develop separate training modules for the following:
1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. DCPS Security personnel.
4. Hardware maintenance personnel.

END OF SECTION

SECTION 32 1800

ATHLETIC AND RECREATIONAL SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Exterior resilient monolithic athletic surfacing.
   2. Accessories.
   3. Line markings.

1.2 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for athletic surfacing.

B. Shop Drawings: Submit project-specific Shop Drawings, drawn to scale, of areas to receive athletic surfacing, showing overall dimensions, line marking layouts, and colors of surfacing and lines.

C. Samples: Submit 12 inch square (300 mm square) samples of athletic surfacing in selected colors.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit cleaning and maintenance data for tiles.
   2. Include copy of submittal in Project information manual.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project, acceptable to athletic surfacing manufacturer.

B. Regulatory Requirements: Comply with applicable provisions of Americans with Disabilities Act.

1.5 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at Site and review installation procedures and coordination with other Work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
   1. Dynaflex Sports Surfacing by Neyra Industries Inc., Cincinnati, OH.
   2. CourtMaster by SealMaster, Inc., Sandusky, OH.

2.2 PRODUCTS

A. Resilient Athletic Surfacing System:
   1. Description: Poured and troweled athletic surfacing system.
   2. Components:
      a. Resurfacer: Lead-free Asphalt emulsion compound to fill and repair minor defects and depressions in asphalt concrete substrate.
      b. Cushion: Liquid-applied, polymer emulsion manufactured with rubber particles and fillers.
      c. Color coating:
         1) Acrylic color coating, asbestos-free, with ultraviolet-stabilizers against fading and bleaching.
         2) Mix with fine sand or mineral aggregate as recommended by manufacturer, and accepted by Architect, for conditions of use.
         3) Provide in colors indicated on Drawings.
      d. Striping paint:
         1) Acrylic line-striping paint, asbestos-free, with UV-stabilizers against fading and bleaching; quick drying and nonbleeding.
         2) Provide in colors indicated on Drawings.

2.3 ACCESSORIES

A. Provide manufacturer's recommended primers and other miscellaneous accessories as suitable for conditions of application and as required for complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare and clean substrate to remove deleterious substances which would impair Work.

3.3 INSTALLATION

A. Install system in accordance with manufacturer's recommendations and final Shop Drawings.

B. Athletic Surfacing System:
   1. Patch depressions in substrate.
   2. Apply 1 or 2 coats of resurfacer as required by porosity of substrate, to provide smooth, uniform surface.
   3. Apply resilient cushion coat.
   4. Color coating:
      a. Apply at least 2 coats of color coating to provide uniform, even-textured surface suitable for conditions of use.
      b. Apply in locations and colors indicated on Drawings.
   5. Line striping:
      a. Paint athletic line markings for basketball and volleyball, in layouts and colors indicated on Drawings.
      b. Paint markings with straight, sharply defined parallel edges.
      c. Apply number of coats as required to produce opaque markings, so that color coating does not show through.

3.4 PROTECTION

A. Prohibit traffic on surfacing until system has cured and painted markings have set and hardened.

B. Protect Work from damage during construction period so that it will be without any indication of use or damage at time of acceptance.

END OF SECTION

SECTION 32 3119

DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Decorative metallic-coated steel tubular picket fences.
   2. Decorative metallic-coated steel security fences.
   3. Decorative steel fences.
   4. Swing gates.
   5. Horizontal-slide gates.
   6. Gate operators, including controls.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 Section "Cast-in-Place Concrete" for concrete for post foundation fill.

B. Division 31 Section "Earth Moving" for site excavation, fill, and backfill where decorative metal fences and gates are located.

1.3 PERFORMANCE REQUIREMENTS

A. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.4 SUBMITTALS

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

B. Samples: Submit samples for each profile and pattern of fabricated metal and for each type of metal finish required, prepared on metal of same thickness and alloy indicated for the Work. Include samples of the following:
   1. Post cap.
   2. Gate hardware, including hinges and latch.

C. Welding certificates.

D. Maintenance Data: For gate operators to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing ornamental metal fences and gates similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Installer Qualifications: Arrange for installation of ornamental metal fences and gates specified in this Section by the same firm that fabricated it.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel.

D. UL Standard: Provide gate operators that comply with UL 325.

E. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 STEEL AND IRON

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

B. Hollow Structural Sections: ASTM A500 Grade B.

C. Steel Sheet: Commercial-quality, cold-rolled, stretcher-leveled, carbon-steel sheet complying with ASTM A 366/A 366M, Class I, matte finish.

D. Castings: Either gray or malleable iron unless otherwise indicated.
   1. Gray-Iron: ASTM A 48, Class 30 (ASTM A 48M, Class 200).
   2. Malleable-Iron: ASTM A 47 (ASTM A 47M).

E. Ductile Iron Castings: ASTM A 536, grade as recommended by fabricator for type of use indicated.

F. Stainless Steel:
   1. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
   2. Bars and Shapes: ASTM A 276, Type 304.

G. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50 (Grade 340), with G90 (Z275) coating.

H. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50 (Grade 340), with AZ60 (AZM180) coating.

2.2 COATING MATERIALS

A. Epoxy Zinc-Rich Primer for Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.
   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. Sherwin-Williams Zinc Clad IV.
      b. PPG Architectural Zinc Rich Epoxy.
      c. PPG Architectural Aquapon Zinc Rich Epoxy.
      d. Carboline Carbozinc 859.

B. Epoxy Primer for Galvanized Steel: Complying with MPI #101 and compatible with coating specified to be applied over it.
   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. Sherwin-Williams Dura-Plate 235 Multi-Purpose Epoxy.
      b. PPG Architectural Amercoat 385PA
      c. PPG Architectural Amerlock 2 AL
      d. PPG Architectural Amerlock 600
      e. Benjamin Moore Surface Tolerant Epoxy Mastic Coating

C. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
   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. Sherwin-Williams Tile-Clad HS Epoxy
      b. Noroo Paint & Coatings Cleanpoxy 3100

D. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
   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. Sherwin-Williams Acrolon 218 HS
      b. Benjamin Moore Aliphatic Acrylic Urethane Gloss
      c. Carboline Carbothane 134 MC
      d. PPG Architectural Pitthane Ultra Gloss 95-812 Series

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
   1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.

B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Division 03 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C 387 mixed with potable water according to manufacturer's written instructions.

C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

2.4 GROUNDING MATERIALS:

A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
   1. Material above Finished Grade: Aluminum.
   2. Material on or below Finished Grade: Copper.
   3. Bonding Jumpers: Braided copper tape, 1 inch wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.

B. Grounding Connectors and Grounding Rods: Comply with UL 467.
   1. Connectors for Below-Grade Use: Exothermic-welded type.
   2. Grounding Rods: Copper-clad steel.
   3. Size: 5/8 by 96 inches.

2.5 ORNAMENTAL STEEL FENCES

A. Decorative Steel Fences: Fences made from steel tubing, bars, and shapes. Fence Design: As indicated in design drawings and depicted in standard details.

B. Fence Height(s): As indicated in design drawings and depicted in standard details.

C. Posts: Square steel tubing.
   1. Line Posts: Minimum line post sizes based on nominal fence height:
      a. 2.5 Feet tall: HSS 2x2x1/8
      b. 3.5 Feet tall: HSS 2x2x3/16
      c. 6 Feet tall: HSS 3x3x3/16
      d. 8 Feet tall: HSS 4x4x3/16
      e. 10 Feet tall: HSS 4x4x1/4
   2. End and Corner Posts: Same size as line posts.
   3. Swing Gate Posts:
      a. For opening 10 feet wide or less: HSS 4x4x1/4
      b. For opening 10 feet wide or less: HSS 6x6x1/4
   4. Horizontal-Slide Gate Posts: HSS 6x6x1/4
   5. Provide one (1) 3/16” diameter weep hole at base of each post.

D. Post Caps: Posts shall terminate in a post cap. Furnish Owner’s selection among the following options at no additional cost:
   1. Cast iron post ball, equivalent to King Metals #45-126-PB
   2. Cast iron pyramidal post cap, equivalent to King Metals #45-3002-2
   3. Cast iron post cap, equivalent to King Metals #45-683B-2
   4. Cast iron bullet-style post cap, equivalent to King Metals #45-9352

E. Rails:
   1. Steel Tube Rails: Square steel tubing 2 by 2 inches with 1/8-inch wall thickness.
   2. Steel channels, 1 1/2 inch by 3/4 inch by 1/8 inch thick.

F. Pickets: Solid 5/8 inch square steel bars.
   1. Extend pickets beyond top rail as indicated.
   2. Picket Spacing: 3-15/16 clear, maximum.

G. Finial: Pickets shall terminate in a top finial. Furnish Owner’s selection among the following options at no additional cost:
   1. Cast iron quad spear w/ ball, equivalent to King Metals #10-6004-58.
   2. Cast iron quad spear, equivalent to King Metals #10-6005-58.
   3. Cast iron triad spear, equivalent to King Metals #10-6007-58.
   4. Cast iron spear, equivalent to King Metals #45-0214-58.

H. Rings: Forged square steel tubing rings, 5/8" 16GA plain tube, sized to fit fence design(s) as depicted in standard details. Equivalent to King Metals #13-31372-358.

I. Fabrication: Assemble fences into sections by welding pickets to rails.
   1. Fabricate sections with clips welded to rails for fastening to posts in field.

J. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.

K. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
   1. Hot-dip galvanize posts[and rails].
   2. Hot-dip galvanize rail and picket assemblies after fabrication.

L. Finish for Steel Items: High-performance coating.

2.6 SWING GATES

A. Gate Configuration: As indicated.

B. Gate Frame Height: As indicated.

C. Gate Opening Width: As indicated.

D. Steel Frames and Bracing: Fabricate members from square steel tubing 2-1/2 by 2-1/2 inches with 1/8-inch wall thickness. Hot-dip galvanize frames after fabrication.

E. Frame Corner Construction: Welded.

F. Infill: See typical details for pedestrian gate expanded metal and protective metal plate infill.

G. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.

H. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking.

I. Spring Hinges: BHMA A156.17, Grade 1, suitable for exterior use.
   1. Function: 320 - Gate spring pivot hinge. Adjustable tension.
   2. Material: Malleable iron.

J. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
   1. Function: 39 - Full surface, triple weight, antifriction bearing.
   2. Material: Wrought steel, forged steel, cast steel, or malleable iron.

K. Exit Hardware: BHMA A156.3, Grade 1, Type 1 (rim exit device), with push pad actuating bar, suitable for exterior use.
   1. Function: 01 - Exit only, no trim or blank escutcheon.

2. Mounting Channel: Bent-plate channel formed from 1/8-inch-thick steel plate. Channel spans gate frame. Exit device is mounted on channel web, recessed between flanges, with flanges extending 1/8 inch beyond push pad surface.

L. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 3/4-inch-diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.

M. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.

N. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

O. Steel Finish: High-performance coating.

2.7 HORIZONTAL-SLIDE GATES

A. Gate Configuration: As indicated.
1. Type: Cantilever slide, with external roller assemblies.

B. Gate Frame Height: As indicated.

C. Gate Opening Width: As indicated.

D. Steel Frames and Bracing: Fabricate members from square tubing. Hot-dip galvanize frames after fabrication.

E. Frame Members: Steel tubing 2-1/2 by 2-1/2 inches 1/8-inch wall thickness.

F. Bracing Members: Steel tubing 2-1/2 by 2-1/2 inches wall thickness.

G. Frame Corner Construction:
1. Welded frame.
2. Overhead Slide Gates: Welded.

H. Additional Rails: Provide as indicated, complying with requirements for fence rails.

I. Infill: Comply with requirements for adjacent fence.

J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.

K. Overhead Track Assembly: Manufacturer's standard track, with overhead framing supports, bracing, and accessories, engineered to support size, weight, width, operation, and design of gate and roller assemblies.

L. Hardware: Latches permitting operation from both sides of gate, locking devices, hangers, roller assemblies, and stops fabricated from galvanized stee. Fabricate latches with integral eye openings for padlocking.

M. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.

N. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

O. Steel Finish: High-performance coating.

2.8 GATE OPERATORS

A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
   1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
   2. Provide operator with UL approval.
   3. Provide electronic components with built-in troubleshooting diagnostic feature.

B. Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Horsepower: Not less than 1/2.
   3. Enclosure: Manufacturer's standard.
   4. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
   5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.

C. Gate Operators: Gate, Concrete base, ,Post, and In-ground mounted and as follows:
   1. Mechanical Slide Gate Operators:
   2. Duty: Heavy duty, commercial/industrial.
   3. Gate Speed: Minimum 60 feet per minute.
   4. Frequency of Use: 25 cycles per hour.
   5. Operating Type: Wheel and rail drive, with manual release.
   6. Drive Type: Enclosed worm gear and chain-and-sprocket reducers, roller-chain drive.

D. Remote Controls: Electric controls separated from gate and motor and drive mechanism, with NEMA ICS 6, Type 4 enclosure for pedestal mounting, and with space for additional optional equipment. Provide the following remote-control device(s):
   1. Radio Control: Digital system consisting of code-compatible universal receiver for each gate, located where indicated, with remote antenna with coaxial cable and mounting brackets designed to operate gates.

2. Vehicle Loop Detector: System including automatic closing timer with adjustable time delay before closing and loop detector designed to open and close gate and hold gate open until traffic clears. Provide electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, as recommended in writing by detection system manufacturer for function indicated.
3. Loop: Wire, in size indicated for field assembly, for pave-over or saw cut with epoxy-grouted installation.

E. Emergency Release Mechanism: Quick-disconnect release of operator drive system of the following type of mechanism, permitting manual operation if operator fails. Design system so control-circuit power is disconnected during manual operation.
1. Type: Integral fail-safe release, allowing gate to be pushed open without mechanical devices, keys, cranks, or special knowledge.

F. Accessories:
1. Battery Backup System: Battery-powered drive and access-control system, independent of primary drive system:
a. Fail Secure: Gate cycles on battery power, then fail safe when battery is discharged.

2.9 STEEL FINISHES

A. Surface Preparation: Clean surfaces according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Powder Coating: Immediately after cleaning, apply 2-coat finish consisting of epoxy primer and TGIC polyester topcoat, with a minimum total dry film thickness of not less than 8 mils. Comply with coating manufacturer's written instructions.

C. Color and Gloss: Black, high gloss.

D. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of 2 mils per applied coat, to surfaces that will be exposed after assembly and installation, and to concealed surfaces.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

2.10

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed.

B. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 DECORATIVE FENCE INSTALLATION

A. Install fences by setting posts as indicated and fastening rails to posts.

B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 4 inches for each foot or fraction of a foot that fence height exceeds 4 feet .

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
   2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.
      a. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
      b. Concealed Concrete: Top 2 inches below grade to allow covering with surface material. Slope top surface of concrete to drain water away from post.

D. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.

E. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
   1. Extend posts at least 5 inches into concrete.
   2. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.

F. Space posts uniformly at 6 feet-6 inches o.c.

3.3 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.4 GATE OPERATOR INSTALLATION

A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.

B. Excavation for Support Posts, Pedestals, and Concrete Bases: Hand-excavate holes for bases, in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.

C. Concrete Bases: Cast-in-place or precast concrete, depth not less than 12 inches below frost line or detail on Drawings, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.

D. Vehicle Loop Detector System: Cut grooves in pavement and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.

E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.5 GROUNDING AND BONDING

A. Fence Grounding: Install at maximum intervals of 1500 feet except as follows:

B. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.

C. Gates and Other Fence Openings: Ground fence on each side of opening.

D. Bond metal gates to gate posts.

E. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

F. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

G. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

H. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.

I. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

J. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

K. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.

L. Make connections with clean, bare metal at points of contact.

M. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

N. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

O. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

P. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.6 FIELD QUALITY CONTROL

A. Grounding-Resistance Testing: Engage a qualified testing agency to perform tests and inspections.

B. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.

C. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.

D. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.7 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, and limit switches.
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lubricate hardware, gate operators, and other moving parts.

3.8 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION

SECTION 281600 INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes intrusion detection with communication links to perform monitoring, alarm, and control functions.

B. Equipment specified in this section includes but is not limited to the following:

1. Control/Communicator (Security Control Panel)
2. Control Station (Keypad)
3. Accessories.

1.2 REFERENCES

A. National Fire Protection Association (NFPA): 70-2020 National Electrical Code The standard for the safe installation of electrical wiring and equipment in the united states.

B. Underwriters Laboratories, Inc. (UL): 294-7th Edition The standard of safety for access control system units

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans and details.

1. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building.
2. Device Address List: Coordinate with final system programming.
3. Sensor detection patterns and adjustment ranges.

C. Contract Closeout Submittals:

1. Hardware Manual: The manual shall describe all equipment furnished.

2. Software Manual: The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation.

3. Operators Manual: The operators manual shall fully explain all procedures and instructions for the operation of the system.

4. Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

5. Operations and Maintenance Data:
   a. Manufacturer's maintenance recommendations.

6. As-Built Drawings: During system installation, maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the Intrusion Detection System (IDS) to be used for record drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the IDS. Copies of the final as-built drawings shall be provided to the end user in PDF format.

1.4 QUALITY ASSURANCE

A. Installer Qualifications

1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
3. A copy of the Contractors Certified Installers Certificate shall be furnished with bid response.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and/or an Installer who has completed systems integration work for installations 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.

C. Testing Agency Qualifications: Member company of NETA or an NRTL.

D. 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.

E. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.

F. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

B. The warranty period for any part which has a warranty by the manufacturer of longer than 12 months shall be for the longer period. Provide a copy of the manufacturer’s warranty period statement for all alarm equipment, all software, all major components, and other major devices.

1.6 SYSTEM DESCRIPTION

A. The actuation of any alarm initiating device shall cause the following to happen:

1. Alarm sirens shall sound on any intrusion alarm activation.
2. Centrally located visual annunciation shall take place at a control station showing the particular point in alarm.
3. Call the DCPS security command center when qualifying events are triggered.

B. The control/communicator (security alarm panel) shall contain initiating and bypass circuits as required, and shall be connected to all necessary equipment to individually and collectively power and effect the operating of the overall security alarm system. All initiating circuits shall be supervised. The control station shall visually annunciate alarm and trouble conditions.

C. Each device shall have its own zone. Each zone shall be labelled at the device and the panel.

D. The alarm vendor shall provide all power supplies, peripheral devices, and equipment required for a complete and operational security alarm system.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURER: Digital Monitoring Products (DMP)

2.2 SECURITY CONTROL PANEL: DMP XR150, DMP XR250, or DMP XR550

2.3 CONTROL STATIONS (KEYPADS): DMP 7060

2.4 PIR MOTION SENSORS:

A. Wall mount: Optex CDX-DAM, Optex CDX-NAM

B. Ceiling mount: Optex KX-08

2.5 AUDIBLE AND VISUAL ALARM DEVICES:

A. Interior Siren: DMP 335

B. Strobe: Honeywell RESON8 SAB, or equivalent

C. External Siren: Honeywell AG8WB, or equivalent

D. External Siren/Strobe: Federal Signal SLM600 StreamLine

2.6 DOOR CONTACTS

A. Provide low-voltage magnetic position sensor with DPDT switch. Utilize recessed door monitors wherever possible.

1. Recessed door monitors: ABS plastic enclosure. Provide Nascom model N1178CW/ STDD, or equal.
2. Surface mounted door monitor: Anodized alloy housing with stainless steel armored cable. Provide Schlage 7766, or equal.
3. Overhead door monitor: Heavy-duty anodized aluminum housing with stainless steel armored cable. Provide Honeywell 658 series switch, or equal.

2.7 GLASS BREAKS

A. Glass break sensors shall not be installed.

2.8 ENCLOSURES

A. Altronix Trove1, Trove2, Trove 3, as appropriate, with Altronix/DMP backplate.

2.9 POWER SUPPLIES

A. Altronix eFlow4NB

2.10 NETWORK COMMUNICATION MODULE

A. Altronix LINQ8PD

2.11 RECHARGABLE BATTERIES

A. Twelve volt (12V) absorbent glass matt valve-regulated lead-acid battery.

B. 1-100 Zones: Two (2) 7.00Ah batteries. Altronix BT126 or PowerSonic PS-1270.

C. 101-200 Zones: Two (2) 12.00Ah batteries. Altronix BT1212 or PowerSonic PS-12120.

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 intrusion detection.

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

3.2 SYSTEM INSTALLATION

A. Comply with UL 681 and NFPA 731.

B. General: The contractor shall install all system components and appurtenances in accordance with manufacturers' instructions, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown.

C. Installation shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of work.

D. Provide a dedicated 120 volt duplex outlet circuit in separate conduit as a source of primary power for the master control/communicator. Mount outlet +80" ± AFF to avoid confusion with convenience outlets. Label outlet "RESERVED FOR SECURITY SYSTEM". Provide ASCO Model 425 surge protective device.

E. All wiring shall be stranded copper and installed in EMT conduit as a separate and segregated system.

F. All conduit, cable, and wire shall be installed parallel and square with building lines. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered, labeled and tied to create an orderly installation.

G. Perform walk tests and set-up procedures for each detector as specified by the manufacturer to ensure that all boundaries of coverage are sufficient to detect intruders in each secured area.

3.3 MOUNTING HEIGHTS

A. Unless noted, security system components shall be mounted at the following heights:

1. Arm/Disarm Panel: 54 inches above finished floor.
2. Motion Detection – per manufacturers requirements.

3.4 WIRING INSTALLATION

A. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

B. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated. Use plenum rated cables.
2. Install wiring in metal raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring

except in unfinished spaces. Minimum conduit size shall be 1/2 inch (13 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

3. All wires shall be labeled at both ends utilizing flag, wrap or heat-shrink style labels. Labels shall be printed with a Scotch/Brother/P-Touch style label printer. All security labels shall be a minimum ½" wide, yellow, with black text. No hand written labels or written text is permitted.
4. Labels at each end shall match final device labels and numbers including intrusion zone numbers.

C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Identify new components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

3.6 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

B. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.

C. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."

1. Inspection: Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.
2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."

C. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."

D. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training."

END OF SECTION 281600