100% BID SET
PROJECT MANUAL

VOLUME 1

for the

THIRD FLOOR RENOVATION OF BLDG 29 LABORATORIES AT NEW IBERIA RESEARCH CENTER

NIH GRANT NO.: 1C06OD034041

4401 WEST ADMIRAL DOYLE DRIVE, NEW IBERIA, LA 70560

Owner:

NEW IBERIA RESEARCH CENTER / FACILITY MANAGEMENT, ADMINISTRATION & FINANCE
UNIVERSITY OF LOUISIANA, LAFAYETTE
PARKER HALL
LAFAYETTE, LA 70503

DIRECTOR OF FACILITY MANAGEMENT
SCOTT HEBERT

GRANTS AWARD MANAGER
PHILLIP J. DUPLECHIN, P.E.

Prepared by:

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Lafayette, LA 70506
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ARCHITECT'S PROJECT No.: 2025.040

APRIL 14, 2026

SECTION 000101
PROJECT TITLE PAGE

PROJECT MANUAL

FOR

NIH GRANT NUMBER: 1C06OD034041
ARCHITECT'S PROJECT NUMBER: 2025.040

THIRD FLOOR RENOVATION OF BLDG 29 LABORATORIES AT
NEW IBERIA RESEACH CENTER / UNIVERSITY OF LOUISIANA, LAFAYETTE

4401 WEST ADMIRAL DOYLE DRIVE
NEW IBERIA , LOUISIANA 70506

DATE: 10 MARCH 2026

PREPARED BY:

CHASE MARSHALL ARCHITECTS

SECTION 000103
PROJECT DIRECTORY

PART 1 GENERAL

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   5. Zip Code: 70503.

Name: THIRD FLOOR RENOVATION OF BLDG 29 LABORATORIES AT NEW IBERIA RESEARCH CENTER / UNIVERSITY OF LOUISIANA, LAFAYETTE.
Address Line 1: 4401 WEST ADMIRAL DOYLE DRIVE.
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State: LOUISIANA.
Zip Code: 70560.

DESIGN TEAM:

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State: LOUISIANA.
Zip Code: 70506.
Telephone: 337.234.5710.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 000107
SEALS PAGE

PROJECT NAME: **THIRD FLOOR RENOVATION OF BLDG 29 LABORATORIES AT NEW IBERIA RESEARCH CENTER**

4401 WEST ADMIRAL DOYLE DRIVE
NEW IBERIA, LOUISIANA 70560

DATE: **MARCH 10, 2026**

ARCHITECTURAL SPECIFICATIONS: THE FOLLOWING SPECIFICATION SECTIONS WERE PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION:

03/10/2026

CHASE MARSHALL ARCHITECTS

024100	**DEMOLITION**
030505	**UNDERSLAB VAPOR BARRIER**
055000	**METAL FABRICATIONS**
055133	**METAL LADDERS**
055213	**PIPE AND TUBE RAILINGS**
057300	**DECORATIVE METAL RAILINGS**
061000	**ROUGH CARPENTRY**
071613	**POLYMER MODIFIED CEMENT WATERPROOFING**
071616	**CRYSTALLINE WATERPROOFING**
072100	**THERMAL INSULATION**

072700 AIR BARRIERS
074213 METAL WALL PANELS
075200 MODIFIED BITUMINOUS MEMBRANE ROOFING
077200 ROOF ACCESSORIES
078100 APPLIED FIRE PROTECTION
078400 FIRESTOPPING
079005 JOINT SEALANTS
081113 HOLLOW METAL DOORS AND FRAMES
084313 ALUMINUM-FRAMED STOREFRONTS
087100 DOOR HARDWARE
088000 GLAZING
092116 GYPSUM BOARD ASSEMBLIES
093000 TILING
096500 RESILIENT FLOORING
096700 FLUID-APPLIED FLOORING
099113 EXTERIOR PAINTING
099123 INTERIOR PAINTING
099600 HIGH PERFORMANCE COATINGS
099723 CONCRETE AND MASONRY COATINGS
101400 SIGNAGE
102113.13 METAL TOILET COMPARTMENTS
102800 TOILET, BATH AND LAUNDRY ACCESSORIES
104400 FIRE PROTECTION SPECIALTIES
115313 LABORATORY FUME HOODS AND RELATED PRODUCTS
115353 BIOLOGICAL SAFETY CABINET AND RELATED PRODUCTS
123450 TRESPA TOPLAB SOLID COMPOSITE LABORATORY WORK SURFACES
123553.13 STEEL LABORATORY CASEWORK AND RELATED PRODUCTS
142400 HYDRAULIC ELEVATORS
313116 TERMITE CONTROL

END OF ARCHITECTURAL

CIVIL SPECIFICATIONS: THE FOLLOWING SPECIFICATION SECTIONS WERE PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION:

CONSULTANT HAS ELECTED TO STAMP, SIGN, AND DATE EACH INDIVIDUAL SECTION.

LCR & COMPANY, L.L.C.

320513 SOILS FOR EXTERIOR IMPROVEMENTS
321313 CONCRETE PAVING

END OF CIVIL

STRUCTURAL SPECIFICATIONS: THE FOLLOWING SPECIFICATION SECTIONS WERE PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION:

CONSULTANT HAS ELECTED TO STAMP, SIGN, AND DATE EACH INDIVIDUAL SECTION.

FOX-NESBIT ENGINEERING, LLC

030500 CRYSTALLINE CONCRETE WATERPROOFING ADDITIVE
033000 CAST-IN-PLACE CONCRETE
051200 STRUCTURAL STEEL FRAMING
053100 STEEL DECKING
054000 COLD-FORMED METAL FRAMING
312000 EARTH MOVING
316329 DRILLED CONCRETE PIERS AND SHAFTS

END OF STRUCTURAL

PLUMBING, MECHANICAL, AND ELECTRICAL SPECIFICATIONS: THE FOLLOWING SPECIFICATION SECTIONS WERE PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION:

CONSULTANT HAS ELECTED TO STAMP, SIGN, AND DATE EACH INDIVIDUAL SECTION.

ADG ENGINEERING

019113 GENERAL COMMISSIONING REQUIREMENTS
220000 PLUMBING GENERAL PROVISIONS
220500 COMMON WORK RESULTS FOR PLUMBING
220519 PLUMBING PIPING
220700 PLUMBING INSULATION
220800 COMMISSIONING OF PLUMBING SYSTEM
221400 DRAINAGE AND VENT SYSTEMS
223310 DOMESTIC HOT WATER HEATERS
224000 PLUMBING FIXTURES AND FIXTURE CARRIERS
224000 PLUMBING FIXTURES
230010 MECHANICAL GENERAL PROVISIONS
230020 BASIC MECHANICAL REQUIREMENTS
230510 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT
230513 ELECTRIC MOTORS
230514 MOTOR STARTERS
230515 VARIABLE FREQUENCY DRIVES
230519 METERS AND GAUGES
230523 HVAC VALVES
230529 HANGERS AND SUPPORTS
230548 VIBRATION ISOLATION
230553 MECHANICAL IDENTIFICATION
230593 TESTING, ADJUSTING, AND BALANCING
230620 HYDRONIC SPECIALTIES
230713 MECHANICAL INS

230800 COMMISSIONING OF HVAC SYSTEMS
230900 HVAC FACILITY MANAGEMENT SYSTEMS
231321 HYDRONIC PIPING
232100 HYDRONIC PUMPS
232513 CHEMICAL WATER TREATMENT
233113 METAL DUCTS
233300 DUCT ACCESSO
233423 HVAC POWER VENTILATORS
233500 LAB EXHAUST FANS
233600 AIR TERMINAL UNITS
233713 DIFFUSERS, REGISTERS, AND GRILLES
236423 AIR COOLED CHILLERS
237313 CENTRAL STATION AIR HANDLING UNITS
260001 ELECTRICAL GENERAL PROVISIONS
260500 BASIC MATERIALS AND METHODS
260526 GROUNDING
260571 ACCEPTANCE TESTING
260572 OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY
260573 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY
260574 OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY
260800 COMMISSIONING OF ELECTRICAL SYSTEM
260923 OCCUPANCY SENSORS
262550 GENERATOR DOCKING STATION
262713 ELECTRICAL DISTRIBUTION SYSTEM
263213 EMERGENCY GENERATOR - DIESEL
263600 TRANSFER SWITHCES
264113 LIGHTNING PROTECTION
264313 SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
265100 LIGHTING FIXTURES
270500 TELE/DATA RACEWAY SYSTEM
273000 AREA OF REFUGE/AREA OF RESCUE ASSISTANCE SIGNAL SYSTEM - DIGITAL (SERIES 4800 AUDIO/VISUAL SERIES)
283110 INTELLEGENT COMMUNICATING FIRE DETECTION SYSTEM (FIRE WARDEN 100)

END OF PLUMBING, MECHANICAL, AND ELECTRICAL

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DIVISION 33 -- UTILITIES (NOT USED)

DIVISION 34 -- TRANSPORTATION (NOT USED)

DIVISION 40 -- PROCESS INTEGRATION (NOT USED)

DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT(NOT USED)

DIVISION 47 -- RESERVED (NOT USED)

DIVISION 49 -- RESERVED (NOT USED)

END OF SECTION

SECTION 001110
SOLICITATION DOCUMENTS

SOLICITATION DOCUMENTS: THE SOLICITATION DOCUMENTS TO BE USED BY CONTRACTORS DURING BIDDING SHALL BE AS PROVIDED BY THE UNIVERSITY OF LOUISIANA LAFAYETTE DEPARTMENT OF FACILITY MANAGEMENT, ADMINISTRATION & FINANCE AND ARE BOUND IN A SEPARATE DOCUMENT UNDER A DIFFERENT COVER. DOCUMENT 001110.17 - GEOTECHNICAL ENGINEERING SERVICES REPORT IS PROVIDED FOLLOWING THIS PAGE.

END OF SECTION

SITE ENGINEERING, INC.
SELECTION ▪ INVESTIGATION ▪ TESTING ▪ ENGINEERING
650 ALBERTSON PARKWAY ▪ BROUSSARD, LA 70518
PHONE 337-981-1414
FAX 337-981-1402

September 9, 2024

Mr. Phillip J. Duplechin
ULL New Iberia Research Center
4401 W. Admiral Doyle Drive
New Iberia, Louisiana 70560

RE: Geotechnical Engineering Services Report
Proposed New Elevator for Building 29
ULL New Iberia Research Center
4401 W. Admiral Doyle Drive
New Iberia, Louisiana
SITE Engineering Project 23-G075-01

Dear Mr. Duplechin:

This report transmits the results of our geotechnical exploration for the above referenced project. The investigation was performed in general accordance with SITE Engineering Proposal Number 23-229G dated September 18, 2023. Authorization to proceed with these services was provided by Mr. Jerry Luke Leblanc of the University of Louisiana at Lafayette on October 3, 2023. However, it should be noted immediately after receiving authorization to proceed, SITE Engineering, Inc. was instructed by Mr. Phillip Duplechin of the University of Louisiana at Lafayette to postpone drilling until further instruction. Final instructions to proceed with the investigation was provided by Mr. Phillip Duplechin on June 14, 2024.

The purpose of this exploration was to investigate the existing subsurface conditions at the site and analyze these conditions for support of the proposed new elevator. This report includes the results of our field and laboratory testing and recommendations for site preparation, foundation design, and construction.

We appreciate the opportunity to provide our services to your project and look forward to our continued participation with the Foundation Engineering and/or Quality Control Testing services during the construction phase. If you have any questions pertaining to this report, or if we may be of further service, please do not hesitate to contact our office.

Sincerely,
SITE ENGINEERING, INC.

Clint S. McDowell, P.E.
President

Distribution: 3 – Above

SITE ENGINEERING, INC.

GEOTECHNICAL ENGINEERING SERVICES REPORT

PROPOSED NEW ELEVATOR FOR BUILDING 29
ULL NEW IBERIA RESEARCH CENTER
4401 W. ADMIRAL DOYLE DRIVE
NEW IBERIA, LOUISIANA

SITE ENGINEERING REPORT NUMBER: 23-G075-01

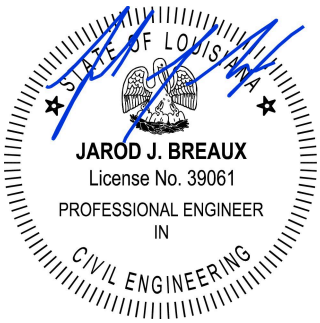
Prepared For

Mr. Phillip J. Duplechin
ULL New Iberia Research Center
4401 W. Admiral Doyle Drive
New Iberia, Louisiana

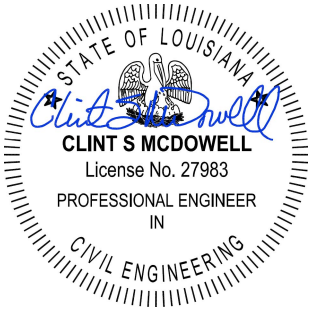
September 9, 2024

By

SITE ENGINEERING, INC.
650 Albertson Parkway
Broussard, Louisiana 70518
(337) 981-1414



Jarod J. Breaux, P.E. (#39061)
Project Engineer



Clint S. McDowell, P.E. (#27983)
President

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1.0 EXECUTIVE SUMMARY

SITE Engineering, Inc. has completed an exploration and evaluation of the subsurface conditions for the proposed new elevator to be constructed at building 29 of the existing ULL New Iberia Research Center located along W. Admiral Doyle Drive in New Iberia, Louisiana. The project will include the construction of an elevator addition to the existing structure. It is assumed the new elevator system will require deep foundation elements such as drilled cast-in-place concrete shafts.

The subsurface conditions in the area intended for construction were explored by the performance of a soil test boring. Our scope of work included performing one (1) boring to a depth of 35 feet below the existing ground surface near the proposed construction area. At the time of the drilling, the subject construction area was occupied by open-aggregate (limestone/crushed concrete) pavements. Upon the initial drilling activities, an obstruction was encountered directly below the surficial aggregate. This obstruction inhibited drilling and the boring was subsequently offset to a grass covered area approximately 60 feet north of the originally planned boring location. It is assumed that all existing infrastructure and/or subsurface debris currently present within the proposed construction area will be removed to facilitate construction.

The boring generally encountered approximately 12 inches of lean clay topsoil followed by interchanging layers of very stiff to soft lean clay soils to a depth of about 32 feet. Below this depth, the boring encountered very stiff fat clay soils extending to a depth of at least 35 feet, the maximum depth explored.

Groundwater was encountered during the drilling operations at a depth of 23 feet below the existing ground surface within the boring performed at this site. Immediately after drilling, the borehole was plugged and abandoned in accordance with state regulations. Therefore, a delayed groundwater reading was not feasible. The attached boring log should be reviewed for specific soil and groundwater information at the boring location.

The near surface clays encountered in the boring performed at the site are considered fair in strength and support capabilities and low in shrink/swell potential. However, due to the anticipated structural loads and the expected differential settlement issues between the new elevator and the existing structure, it is recommended that the proposed elevator be supported by deep foundation elements. Therefore, we are providing recommendations for drilled cast-in-place concrete shafts as an economical and feasible deep foundation type for this project.

Details related to site development, foundation design, and construction considerations are included in subsequent sections of this report. The owner/designer should not rely solely on this Executive Summary and must read and evaluate the entire contents of this report prior to utilizing our engineering recommendations in preparation of design/construction documents.

2.0 PROJECT INFORMATION

2.1 Project Authorization

SITE Engineering, Inc. has completed a geotechnical exploration for the proposed new elevator to be constructed at building 29 of the existing ULL New Iberia Research Center located along W. Admiral Doyle Drive in New Iberia, Louisiana. The investigation was performed in general accordance with SITE Engineering Proposal Number 23-229G dated September 18, 2023. Authorization to proceed with these services was provided in UL Contract Number C002273 Amendment 1 and Purchase Order Number P2401089. We were initially authorized to begin work on October 3, 2023. However, it should be noted immediately after receiving authorization to proceed, SITE Engineering, Inc. was instructed by Mr. Phillip Duplechin of the University of Louisiana at Lafayette to postpone drilling until further instruction. Final instructions to proceed with the investigation were provided on June 14, 2024.

2.2 Project Description

The project will include the construction of an elevator addition to the existing building number 29. Structural loads associated with the proposed construction have not been provided at this time. However, for purposes of this report, it is anticipated that concentrated loads will be less than 40 kips in compression and/or tension. Wall loads should be less than 3 kips per linear foot.

Topographic information such as existing site grades and proposed finished elevations has also not been provided. However, we have assumed that less than 12 inches of cut and/or fill will be required to reach design elevation in the areas intended for construction.

The geotechnical recommendations presented herein are based on the available project information, proposed structure location, and the subsurface soils encountered in the boring and as described in this report. If any of the noted information is incorrect, please inform SITE Engineering, Inc. in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. SITE Engineering, Inc. will not be responsible for the implementation of recommendations presented herein if not notified of changes in the project.

2.3 Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to enable an evaluation of an acceptable foundation system for the proposed new elevator. Our scope of services included performing one (1) boring to a depth of 35 feet below the existing ground surface. Our services also included laboratory testing on selected soil samples and preparation of this geotechnical report. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- Foundation design recommendations including allowable compression and tension (uplift) capacities for drilled cast-in-place concrete shafts/piers;
- Estimates of settlement for the recommended foundation type, and;
- Construction considerations including potential groundwater concerns, presence of deleterious material, stripping depths, subgrade preparation, and material and compaction recommendations for fill and backfill.

Our services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below, or around this site. Any statements in this report or on the boring log regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Project Location and Site Description

The address of the existing ULL New Iberia Research Center is reported to be 4401 W. Admiral Doyle Drive in New Iberia, Louisiana. The proposed elevator will be constructed on the north side building 29.

At the time of the drilling, the subject construction area was occupied by open-aggregate (limestone/crushed concrete) pavements. Upon the initial drilling activities, an obstruction was encountered directly below the surficial aggregate. This obstruction inhibited drilling and the boring was subsequently offset to a grass covered area approximately 60 feet north of the originally planned boring location. It is assumed that all existing infrastructure and/or subsurface debris currently present within the proposed construction area will be removed to facilitate construction.

Existing site topographic information and proposed finished grades have not been provided for this project. However, based on visual observations, the site appears to be relatively level with little elevation difference between high and low points within the area intended for construction.

3.2 Subsurface Conditions

The subsurface conditions were explored with one (1) soil test boring drilled to a depth of 35 feet below the existing ground surface. The number, depth, and location of the boring was determined by SITE Engineering, Inc. The boring was located on the subject site by a representative of SITE Engineering with the assistance of Mr. Callen Huval of the University of Louisiana at Lafayette. The approximate location of the boring can be seen on the boring location diagram provided in the appendix of this report.

The boring was advanced utilizing continuous flight auger drilling techniques. Soil samples were obtained continuously in the upper ten feet of the boring and on five-foot centers thereafter to the boring completion depth. Drilling and sampling methods were accomplished in general accordance with ASTM procedures. Upon completion of the drilling, the boring was plugged and abandoned in accordance with requirements of the Louisiana Department of Natural Resources.

Undisturbed samples of cohesive soils were generally obtained using three-inch diameter thin-wall tube samplers (Shelby tube) in general accordance with the procedures for “Thin-Walled Tube Geotechnical Sampling of Soils” (ASTM D1587). These samples were extruded in the field with a hydraulic ram. Undisturbed and representative disturbed samples were wrapped in foil, placed in polyethylene plastic bags to protect against moisture loss, identified according to boring number and depth, and transported to the laboratory in special containers to prevent disturbance. All of the samples obtained from the field exploration were identified and evaluated by experienced geotechnical personnel upon arrival at the laboratory.

In addition to the field exploration, a supplemental laboratory-testing program was conducted to evaluate additional pertinent engineering characteristics of the subsurface materials necessary in analyzing the behavior of the foundation system for the proposed project. The laboratory-testing program included supplementary visual classification and water content tests on all soil samples. In addition, selected samples were subjected to unconfined compressive strength testing, and Atterberg Limits determinations. Additional estimates of shear strength were also determined through the use of a pocket penetrometer and hand torvane.

The boring generally encountered approximately 12 inches of lean clay topsoil followed by interchanging layers of very stiff to soft lean clay soils to a depth of about 32 feet. Below this depth, the boring encountered very stiff fat clay soils to a depth of 35 feet, the maximum depth explored.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring log included in the appendix should be reviewed for specific information. This record includes soil descriptions, stratifications, locations of the samples and laboratory test data. The stratifications shown on the boring log represent the conditions only at the actual boring location. Variations may occur and should be expected throughout the site. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on the boring log. The samples which were not altered by laboratory testing will be retained for 60 days from the date of this report and then discarded.

3.3 Groundwater Information

Groundwater was encountered during the drilling operations at a depth of 23 feet below the existing ground surface within the boring performed at this site. Immediately after drilling, the borehole was plugged and abandoned in accordance with state regulations. Therefore, a delayed groundwater reading was not feasible. The attached boring log should be reviewed for specific soil and groundwater information at the boring location.

The groundwater information provided above were the conditions recorded at the time of our field investigation. It should be noted, however, that it is possible for a groundwater table to be present at later time depending upon climatic and rainfall conditions. Therefore, we recommend that the Contractor determine the actual groundwater levels at the site at the time of the construction activities.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General

The type and depth of foundation suitable for a given structure primarily depends on several factors including the subsurface conditions, the function of the structure, the loads it may carry, the cost of the foundation and the criteria set by the Design Engineer with respect to vertical and differential movement which the structure can withstand without damage. The near surface clays encountered in the boring performed at the site are considered fair in strength and support capabilities and low in shrink/swell potential. However, due to the anticipated structural loads and the expected differential settlement issues between the new elevator and the existing structure, it is recommended that the proposed elevator be supported by deep foundation elements. Therefore, we are providing recommendations for drilled cast-in-place concrete shafts as an economical and feasible deep foundation type. Specific details related to site preparation, foundation design and construction considerations will be presented in subsequent paragraphs.

4.2 Site Preparation

We recommend that all topsoil, organics, limestone/crushed concrete, concrete, debris, utilities, and any soft, loose or deleterious soils in the areas intended for construction and for a distance of at least 5 feet beyond the perimeter of the proposed structure be stripped from the site and either wasted or stockpiled for later use in landscaping. As previously mentioned, an obstruction was encountered directly below the surficial aggregate. This obstruction inhibited drilling and, therefore, an accurate anticipated stripping depth within the proposed construction area could not be determined.

For purposes of this report and the recommendations provided herein, it is assumed that the obstruction encountered is somewhat surficial and does not extend deeper than 6 feet below existing grade. It is recommended that test pits be performed within the proposed construction area prior to construction to accurately investigate the extent of the obstruction encountered during our investigation and/or to investigate the presence of other potential debris. All debris currently present should be removed to facilitate construction. If debris is present deeper than 6 feet, SITE Engineering, Inc. should be contacted and allowed to amend the recommendations provided herein as necessary.

Shallow foundation elements, if encountered, should be removed in their entirety. Deep foundation elements, if encountered, in areas intended for new construction should be cut off to a depth of at least 3 feet below the bottom elevation of the new foundation elements and/or slab. If existing deep foundation elements are observed in the area intended for new construction, the location of each of these elements should be surveyed and provided to the geotechnical engineer along with the proposed foundation plan to determine if any revisions to the recommendations provided herein are necessary.

Based on our experience with reconstruction on or adjacent to existing building sites, soft/loose, wet and/or disturbed soil conditions are often encountered under existing floor slabs and pavements due to leaking utility lines and disturbance of the surficial soils during demolition. Therefore, the depth of stripping required to adequately remove soft or disturbed soils should be determined in the field by the geotechnical engineer at the time of construction. The stripped soil should be wasted or stockpiled for later use in landscaping.

Upon stripping and excavation to the proposed subgrade level and prior to placement of any required structural fill, the exposed soils in the proposed construction area should be proofrolled with a loaded tandem axle dump truck or similar heavy rubber-tired vehicle weighing approximately 15 to 20 tons. Soils which are observed to rut or deflect excessively under the moving load should be further undercut and replaced with properly compacted structural fill. The proofrolling, undercutting and filling activities should be witnessed by a representative of the geotechnical engineer and should be performed during a period of dry weather.

The upper soils encountered in the boring are expected to be somewhat moisture sensitive and if wet at the time of construction these materials may be soft and unstable. If construction occurs during wet weather periods it may be necessary to further undercut and replace or chemically treat the surficial soils. If chemical treatment is desirable, SITE Engineering, Inc. should be contacted to provide further recommendations.

After stripping and subgrade preparation as described above and verification or provision of a stable subgrade, placement of structural fill may begin. The first layer of structural fill should be placed in a relatively uniform horizontal lift and be keyed into the adequately stripped and scarified subgrade soils. Structural fill soils should be free of organic or other deleterious materials, having a maximum particle size less than 2 inches, a liquid limit less than 42 percent, a plasticity index between 10 and 22, and classify as CL in accordance with the Unified Soil Classification System (ASTM D-2487). Soils which classify as ML (silts) or CL-ML (silty-clays) should not be used as structural fill due to their moisture sensitive nature.

All structural fill within the proposed construction areas and for a distance of at least 5 feet beyond the perimeter of the new elevator should be compacted to at least 95 percent of standard Proctor maximum dry density as determined by ASTM Designation D-698. Structural fill should be placed in maximum lifts of 8 to 9 inches of loose material and should be compacted within the range of one (1) percentage point below to three (3) percentage points above the optimum moisture content value.

Close moisture content control will be required to achieve the recommended degree of compaction. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted structural fill should be tested by a qualified geotechnical engineer or his representative prior to placement of subsequent lifts. After adequate compaction of each lift has been verified, light scarification of the surface of the lift should be performed prior to placement of additional fill to ensure an adequate bond between lifts. This can generally be accomplished with the tracks of heavy construction equipment such as a bulldozer or excavator. Furthermore, the edges of compacted structural fill should extend at least 5 feet beyond the edges of the building prior to sloping. Care should be taken to apply compactive effort throughout the structural fill and structural fill slope areas.

We also recommend that water not be allowed to collect in the foundation excavations or on prepared subgrades of the construction areas either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the buildings and beneath the floor slabs.

4.3 Drilled Shaft Foundation System

As with any addition, there is a potential for differential settlement between the existing structure and the proposed addition. To minimize this issue, deep foundation elements are typically utilized for support of additions. Therefore, we are providing recommendations for drilled cast-in-place concrete shafts as a cost-effective deep foundation option for support of the new elevator. The shafts, which are specialized foundation elements, should be installed by contractors having adequate experience in the methods of installation in similar soil conditions. In addition, it should be noted that drilled shaft installation involves removing the existing soil. Consideration needs to be given to soil removal and disposal.

As previously mentioned, an obstruction was observed directly below the surficial aggregate within the proposed construction area. The aforementioned obstruction inhibited drilling and the boring was subsequently offset to a grass covered area approximately 60 feet north of the originally planned boring location. Due to the required boring location offset, higher than typical factors of safety were utilized to account for potential soil variations.

The axial compression capacities of drilled concrete shafts have been computed using a factor of safety of 2.5 against failure at the shaft/soil interface (skin friction) and a factor of safety of 5.0 against end bearing failure. The following tables present the allowable compressive capacities of various diameter drilled shafts installed to various tip embedments below the existing ground surface elevation. The provided compression capacities include the effective weight of the shaft.

ALLOWABLE COMPRESSION CAPACITY OF DRILLED CAST-IN-PLACE CONCRETE SHAFTS

ESTIMATED ALLOWABLE SINGLE SHAFT LOAD CAPACITY IN KIPS
(Factor of Safety = 2.5 for Skin Friction and 5.0 for End Bearing)

Installation Depth* (feet)	Shaft Diameter			
	18-inch	24-inch	30-inch	36-inch
20	11	13	15	16
25	15	18	21	23
30	20	25	29	31

*Below existing grade

The following table presents the allowable uplift capacities of various diameter drilled shafts installed to depths between 20 and 30 feet below the existing ground surface elevation. The uplift or tension capacities of the shafts have been computed using a factor of safety of 3.0 against failure at the shaft/soil interface. The effective weight of the shaft has been excluded in the uplift capacities.

ALLOWABLE UPLIFT CAPACITY OF DRILLED CAST-IN-PLACE CONCRETE SHAFTS				
ESTIMATED ALLOWABLE SINGLE SHAFT LOAD CAPACITY IN KIPS (Factor of Safety = 3.0)				
Installation Depth* (feet)	**Shaft Diameter**			
	18-inch	**24-inch**	**30-inch**	**36-inch**
20	11	15	19	23
25	16	21	26	31
30	20	27	34	41

*Below existing grade.

Installation depths in the above tables are referenced from the existing ground surface elevations at our boring location at the time of drilling. However, a shaft cut-off of up to 3 feet should have little effect on the capacities provided. It should also be noted that the capacities provided above are based on geotechnical properties and soil-shaft relationship only. Consideration should be given to the structural integrity of the shaft itself under the design load conditions. Again, the effective weight of the shaft has been included in the compression and excluded in the uplift capacities provided above.

It should also be noted that the shaft capacity estimates were calculated using strength values from laboratory testing performed on samples of the subsurface soils from the boring performed at this site. Therefore, it is anticipated that shaft capacities across the site could vary slightly.

The values presented above assume each shaft is isolated from any influence of nearby foundation loading. Center-to-center spacing between shafts should be at least 3 shaft diameters. Settlement of isolated drilled shafts up to 36 inches in diameter designed in accordance with the recommendations provided above should be less than ½-inch. Differential settlement between the elevator and the existing structure will equal the realized total settlement of the addition.

Due to the interchanging soft soil layers encountered below a depth of about 12 feet, installation of shafts at this site will likely require the use of casing and/or drilling slurry during augering. If a slurry method is used, the slurry level in the shaft should be maintained even with the ground surface. As concrete is being placed the tremie should be kept at least three feet below the top of the concrete in the shaft. Concrete should be placed with a slump in the range of six (6) to eight (8) inches and be designed to achieve the required strength at the recommended slump.

Installation of the shafts should be carried out in accordance with the National Highway Institute Course No. 132014 entitled “Drilled Shafts: Construction Procedures and Design Methods”, Publication Number FHWA-NHI-18-024 published in September 2018. Care should be taken to ensure concrete is not allowed to strike the reinforcing steel or sides of the shaft excavation. We recommend that the geotechnical engineer or his representative observe the installation of the shafts to verify that, among other things: 1) the subsurface conditions are as anticipated from the borings, 2) the shafts are constructed to the proper diameter, penetration, plumbness, and with appropriate concrete slump, 3) reinforcing steel is properly placed and spaced in the open shaft, and 4) a tremie is properly used for concrete placement. These critical items are fundamental to proper performance of shafts in accordance with design recommendations.

4.4 Lateral Capacity of Deep Foundations

For deep foundations, the lateral loads are resisted by the soil as well as the rigidity of the shaft or pier. Analyses can be performed by methods ranging from chart solutions to finite difference methods. If desirable, SITE Engineering can perform a lateral load analysis for the proposed foundation system once the shaft sizes, length, and group dimensions are determined.

4.5 Other Foundation Types

It should be noted that foundation types other than those discussed in this report could be used for support of the structure at this site. These foundation systems include but are not limited to auger cast-in-place piles, driven piles of various materials, and screwed helical piles. SITE Engineering, Inc. can provide design recommendations for other foundation types at your request.

4.6 At-Grade Floor Slabs

Where deep foundation elements are used for support of structures of the type proposed, a structural slab should be utilized to carry the loads independent of the grade. The slab should be adequately reinforced with either conventional or post-tensioned reinforcement and stiffened with interior ribs or grade beams. Interior grade beams should be at least 18 inches deep from the top of the slab. The spacing of the ribs should be determined by the structural engineer based on the thickness of the slab and the spacing of the shafts but should in no case be greater than 15 feet. Where practical, these ribs should be arranged to coincide with non-load bearing interior walls. A minimum beam width of 12 inches is recommended to allow adequate bearing area. The floor slab and interior grade beams should be a monolithic unit with no joints. If concrete cannot be placed monolithically, it should be doweled to provide continuity and good rigidity.

Furthermore, if moisture sensitive floor coverings are used on the interior slab, consideration should be given to the use of barriers (either polyethylene or a thin sand, graded gravel, or limestone) to minimize potential vapor rise through the slab. Other design and construction considerations, as outlined in the American Concrete Institute (ACI) Design manual (section 302.1R) are recommended.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Testing and Inspection

Many problems can be avoided or solved in the field if proper inspection and testing services are provided. It is recommended that the site preparation, foundation, and floor slab construction be monitored by the geotechnical engineer or his representative.

Density tests should be performed to verify compaction and moisture content in the fill and base material. Each lift of fill soil should be tested and approved by the soils engineer prior to placement of subsequent lifts. It is recommended that field density tests be performed at a frequency of not less than one test per 2,500 square feet of surface area per lift in the building footprint, with a minimum of three tests per lift.

Inspection should be performed prior to and during concrete placement. Foundation excavations should be observed by the soils engineer or his representative to verify that the exposed materials are suitable for support of the foundations.

It is recommended that SITE Engineering, Inc. be retained to provide observation and testing of construction activities involved in the foundations, earthwork, and related activities of this project. SITE Engineering, Inc. cannot accept any responsibility for any conditions which deviated from those described in this report, nor for the performance of the foundations if not engaged to also provide construction observation and testing for this project.

5.2 Moisture Sensitive Soils/Weather Related Concerns

The surficial soils encountered on this site are expected to be somewhat sensitive to changes in moisture content and may lose strength if allowed to become wet. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities.

It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. If the upper soils are allowed to become saturated and the construction schedule does not allow for drying of the soils naturally, then removal and replacement will likely be required.

5.3 Drainage and Groundwater Concerns

Water should not be allowed to collect in the foundation excavation, slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the foundation area.

Groundwater was encountered during the drilling operations at a depth of 23 feet below the existing ground surface within the boring performed at this site. It should be noted, however, that it is possible for a groundwater table to be present closer to the surface at later time depending upon climatic and rainfall conditions. Therefore, we recommend that the Contractor determine the actual groundwater levels at the site at the time of the construction activities.

The site should be graded in anticipation of wet weather periods to help prevent water from "ponding" within the construction areas and/or flowing into excavations. Filtered sump pumps placed in the bottoms of excavations, or other conventional dewatering techniques, such as drainage swales or other methods approved by the geotechnical engineer, are expected to be suitable for control of surface or runoff water. However, if uncontrollable groundwater infiltration into the excavations is experienced during construction, SITE Engineering should be contacted.

5.4 Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. We are providing this information solely as a service to our client. SITE Engineering, Inc. does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

6.0 REPORT LIMITATIONS

The recommendations submitted, in this report, are based on the available subsurface information obtained by SITE Engineering for the proposed project. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, SITE Engineering should be notified immediately to determine if changes in the recommendations are required. If we are not notified of such changes or conditions, SITE Engineering will not be responsible for the impact of those changes or conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplemental recommendations. This report has been prepared for the exclusive use of the University of Louisiana at Lafayette or their assigns for the specific application for the proposed new elevator to be constructed at the referenced location in New Iberia, Louisiana.

APPENDIX

Boring Location Diagram

SITE ENGINEERING, INC.

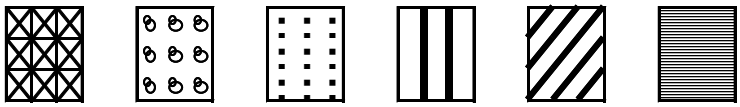
ULL New Iberia Research Center
Proposed New Elevator for Building 29
4401 W. Admiral Doyle Drive
New Iberia, Louisiana

Project #23-G075-02
Date: September 9, 2024

(#) = Approximate Boring Location

KEY TO TERMS AND SYMBOLS USED ON LOGS

SOIL TYPE

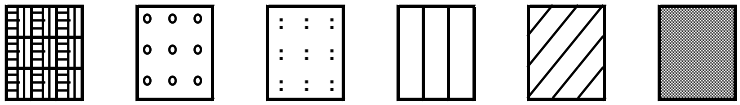


ROCK | GRAVEL | SAND | SILT | CLAY | PEAT

SAMPLE TYPE

NO SAMPLE | AUGER SAMPLE | SHELBY TUBE | SPLIT SPOON

MODIFIERS



STONE or CONCRETE | GRAVELY | SANDY | SILTY | CLAYEY | FILL or TOPSOIL

NO RECOVERY | ROCK CORE | 2" SHELBY TUBE | TXDOT CONE

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D 2487-98

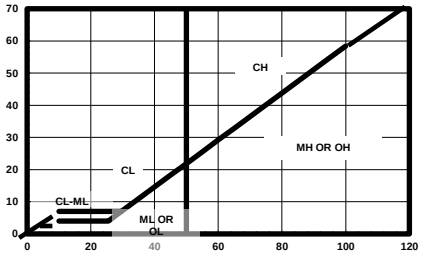
MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (LESS THAN 50% PASSING NO. 200 SIEVE)	GRAVEL & GRAVELY SOILS LESS THAN 50% PASSING NO. 4 SIEVE	CLEAN GRAVEL (LITTLE OR NO FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		W/ APPRECIA BLE FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN 50% PASSING NO. 4 SIEVE	CLEAN SANDS LITTLE FINES	SW	WELL GRADED SAND, GRAVELY SAND (LITTLE FINES)
			SP	POORLY GRADED SANDS, GRAVELY SAND (L.FINES)
		SANDS WITH APPREA. FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS,SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% PASSING NO. 200 SIEVE)	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & VERY FINE SANDS,ROCK FLOUR SILTY OR CLAYEY FINE SANDS OR CLAYEY SILT W/ LOW PI
			CL	INORGANIC CLAY OF LOW TO MEDIUM PI LEAN CLAY GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PI
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
			OH	ORGANIC CLAYS OF MED TO HIGH PI, ORGANIC SILT
HIGHLY ORGANIC SOIL			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS
UNCLASSIFIED FILL MATERIALS			ARTIFICIALLY DEPOSITED AND OTHER UNCLASSIFIED SOILS AND MAN-MADE SOIL MIXTURES	

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH IN TONS/FT^2
VERY SOFT	0.0 TO 0.25
SOFT	0.25 TO 0.50
FIRM	0.50 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	> 4.0 OR 4.0+

RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (BLOWS/FOOT)
VERY LOOSE	0-4
LOOSE	4-9
MEDIUM DENSE	10-29
DENSE	30-49
VERY DENSE	> 50 OR 50+



ABBREVIATIONS

Qp - HAND PENETROMETER
Qt - TORVANE
MV - MINIATURE VANE
Qu - UNCONFINED COMPRESSION TEST
UU - UNCONSOLIDATED UNDRAINED TRAIXIAL
CU - CONSOLIDATED UNDRAINED

▼ GROUNDWATER FIRST ENCOUNTERED

▽ (? HRS) DELAYED GROUNDWATER READING W/ ELAPSED TIME

CLASSIFICATION OF GRANULAR SOILS

U.S. STANDARD SIEVE SIZE(S)

6"	3"	3/4"	4	10	40	200

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		

152	76.2	19.1	4.76	2.0	0.42	0.074	0.002

GRAIN SIZE IN MM

LOG OF BORING B-1

Proposed New Elevator for Building 29

ULL New Iberia Research Center

New Iberia, Louisiana

TYPE OF BORING: Solid Flight Auger — SITE Project #: 23-G075

DEPTH, FT.	SOIL TYPE	SAMPLE TYPE	SOIL DESCRIPTION **SURFACE ELEVATION:** Existing Grade	N-VALUE, blows per foot	UNCONFINED COMPRESSIVE STRENGTH (Qu), tsf	HAND PENETROMETER (Qp), tsf	TORVANE (Qt), tsf	UNIT DRY WEIGHT pcf	MOISTURE CONTENT, %	LIQUID LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE
			12" Lean Clay topsoil		2.88	4.5+		95	22			
			Very stiff brown lean CLAY (CL) with silt		2.08	3.0		105	20	36	16	
5			Stiff to firm light brown lean CLAY (CL) with silt and ferrous nodules		0.78	1.5	0.40	92	28 29	49	28	
10			Stiff to firm brown lean CLAY (CL) with silt and ferrous nodules		1.25 0.60	2.0	0.30	88 91	28 28			
15			Soft brown lean CLAY (CL) with silt and ferrous nodules		0.34		0.20	81	35	37	14	
20			Stiff light brown and gray lean CLAY (CL) with silt ▼		1.30	2.0		106	20			
25			Soft light brown and gray lean CLAY (CL) with silt		0.36		0.20	91	28			
30			Stiff light brown and gray lean CLAY (CL) with silt		1.01	1.5		102	23			
35			Very stiff gray and light brown fat CLAY (CH)		3.09	4.0		109	20			
40			Boring terminated at 35 feet below grade									
45												
50												

DEPTH OF BORING: 35 Feet Below Existing Grade — **DEPTH TO GROUNDWATER:** 23 Feet Below Existing Grade

DATE OF BORING: August 12, 2024

SITE Engineering, Inc.

SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
B. Related Sections:
   1. Division 22 Section "Commissioning of Plumbing System" - commissioning process activities for Plumbing systems, assemblies, equipment, and components.
   2. Division 23 Section "Commissioning of HVAC Systems" - commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
   3. Division 26 Section “Commissioning of Electrical System” - commissioning process activities for Electrical systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
C. CxA: Commissioning Agent.
D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
E. Systems, Subsystems, Equipment, and Components: where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 DESCRIPTION OF WORK

A. The commissioning agent (CxA) is a subcontractor directly to the general contractor for this project. The CxA has overall responsibility for planning and coordinating the commissioning process. However, commissioning involves all parties to the design and construction process, including the contractor and their subcontractors.

B. The purpose of the commissioning process is to provide the owner/operator of the facility with assurance that the HVAC, Electrical, and Plumbing Systems have been installed according to the contract documents and operate within the performance guidelines set out in the specifications. The CxA will provide the owner with an unbiased, objective view of the system's installation, operation, and performance. The commissioning process does not take away or reduce the responsibility of the installing contractors to provide a finished product, installed and fully functional in accordance with the contract documents.

C. Commissioning is intended to enhance the quality of system start-up and aid in the orderly completion and transfer of systems for beneficial use by the owner. The CxA will be the leader of the commissioning team, planning and coordinating all commissioning activities in conjunction with the design professionals, construction manager, subcontractors, manufacturers and equipment suppliers.

D. The General Contractor, Plumbing Contractor, Electrical Contractor, Controls Contractor, and HVAC Contractor shall be responsible for cooperating, and coordinating their work, with the CxA. They shall also be responsible for carrying out all the physical activities required for installation of components and systems and operating them during the commissioning process as required in this Section.

1.5 REFERENCES

A. ACG Building Systems Commissioning Guideline

B. ASHE Commissioning Guideline-2010

C. ASHRAE Guideline 0-2019 The Commissioning Process

D. ASHRAE Standard 202-2024 -- The Commissioning Process Requirements for New Buildings and New Systems

1.6 MEMBERS OF THE COMMISSIONING TEAM

A. The commissioning team will be comprised of representatives from each discipline involved in the commissioning process. The core members of the team will be required to attend all meetings.

B. Members appointed by Owner
1. CxA is the designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process.
2. Representatives of the facility user and operation and maintenance personnel. Architect and engineering design professionals.
3. Owner will engage the CxA under a separate contract.

C. Team Members Appointed by Contractor(s):
1. Representatives of each contractor, including project superintendent and subcontractors, installers, vendor, suppliers, and specialists deemed appropriate by the CxA. The individuals shall each have authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
2. The commissioning team will meet on a regular basis as defined by the CxA in the

"kick-off" meeting. The frequency of the meetings will be determined by the activity of the construction and the nearness to completion of each specialty.

3. Non-core team members will be required to attend meetings as scheduled by the team in order to provide seamless continuity to the commissioning progress schedule.

1.7 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation (if applicable) to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation (if applicable), prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.8 EACH CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Action Items Log.
3. Attend commissioning team meetings held on a monthly basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete paper and electronic construction checklists as Work is completed and provide to the Commissioning Agent on a monthly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Agent.
8. Complete commissioning process test procedures.

B. Construction Manager

1. Participate in construction coordination.
2. Participate in the commission process and attend all meetings.
3. Develop the project schedule.
4. Work with the CxA to incorporate the commissioning schedule into the project schedule.
5. Ensure that subcontractors perform assigned responsibilities in a timely manner to meet the schedule.
6. Submit to CxA pre-functional test forms that meet the specifications and are typically used for the start-up of major equipment and systems.
7. Participate in maintenance orientation and inspection.
8. Participate in O&M training
9. Certify work is complete and systems are operational.

C. Subcontractors
   1. Participate in commissioning team meetings.
   2. Cooperate with all commissioning team members and work in a cohesive manner to accomplish the commissioning process objectives.
   3. Provide schedules for the O&M data submittals and equipment start-up and testing to the CxA for incorporation into the commissioning plan. Update the schedule on a regular basis throughout the construction phase.
   4. Provide information to the CxA for developing the construction phase commissioning plan.
   5. Ensure participation of major equipment manufacturing in appropriate start-up, testing, and training activities.
   6. Provide sufficient personnel to assist the CxA as required during equipment start-ups, system verification and functional performance testing.

1.9 CxA's RESPONSIBILITIES

A. Organize and lead the commissioning team.
B. Provide commissioning plan.
C. Convene commissioning team meetings as needed to facilitate commissioning activities.
D. Attends selected project meetings. The CxA reviews the minutes of the regular project meetings and attends selected project meetings as needed to resolve issues and concerns and coordinate the commissioning process.
E. Review Submittal data and shop drawings related to the commissioning process to ensure conformance to the construction documents. Reviews the documents with the O&M personnel and forwards comments and concerns to the design team and the Owner. The design team reviews these and considers incorporating the items into the design team's formal review process. The project team then discusses and resolves any Cx & O&M personnel comments and concerns that the design team does not incorporated into its formal review.
F. Provide Project-specific construction (start-up) checklists and commissioning process functional test procedures
G. Witness systems, assemblies, equipment, and component startup
H. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
I. Prepare and maintain the Actions Item Log
J. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Action Items Log
K. Facilitate implementation of HVAC control system trends
L. Prepare and maintain completed construction checklist log.
M. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report

END OF SECTION 019113

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

B. Selective removal and disposal of existing construction as indicated on Drawings and as required to accommodate new construction. Demolition work includes, but is not limited to, the following:
   1. Selective demolition and removal of portions of existing building.
   2. Protection of existing structure affected by demolition operations.
   3. Protection of existing utilities to remain.
   4. Pollution control during demolition operations.
   5. Notification to Owner of schedule of shut-off of utilities which serve occupied spaces of adjacent buildings.
   6. Removal and legal disposal of materials.

1.03 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 011000 - Summary: Sequencing and staging requirements.

C. Section 011000 - Summary: Description of items to be removed by Owner.

D. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

E. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

F. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.05 DEFINITIONS

A. **Remove:** Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. **Remove and Salvage:** Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.06 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.07 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.

C. Proposed Protection Measures- Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property for dust control and for noise control. Indicate proposed locations and construction of barriers.

D. Demolition Plan- Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
      a. Schedule of Building Demolition Activities:
         1) Submit two (2) copies of demolition work schedule for review by Architect prior to commencement of work. Indicate the following:
            (a) Proposed methods for demolition.
            (b) Detailed sequence of demolition work, with starting and ending dates for each activity.
            (c) Temporary interruption of utility services.
            (d) Shutoff and capping or re-routing of utility services.
            (e) Coordinate shut-off, capping, and continuation of utility services.
            (f) Relate requirements to phased construction activities, together with details for dust and noise control protection.
   2. Pre-demolition Photographs or Video- Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit documentation to Architect before the Work begins.
   3. Demolition firm qualifications.

E. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.08 PROJECT CONDITIONS

A. Area immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied building will not be disrupted.
   1. Provide not less than 72 hours' notice of demolition activities that will affect Owner's normal operations of adjacent occupied building.
   2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
      a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. Hazardous Materials- It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

C. Contractor-Salvaged Items- Items indicated to be removed but of salvageable value to Contractor may be removed from site as work progresses. Transport salvaged items from site as they are removed.

1. On-site storage or sale of removed items or materials is not permitted.

D. Building Services- Maintain existing mechanical and electrical services indicated to remain, keep in service, and protect against damage during demolition operations. Do not interrupt existing services serving occupied or used facilities, except when authorized in writing by Owner. Provide temporary services during interruptions as acceptable to Owner.

1.09 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 PREPARATION- GENERAL

A. Inspections- Prior to commencement of demolition work, inspect adjacent occupied areas and areas in which work will be performed. Provide documentation specified under “SUBMITTALS” of this Section.

B. Protection- Provide protections as specified in PART 1 of this Section. Cover and protect duct openings, equipment and fixtures to remain from soiling and damage when demolition work is performed in rooms or areas from which such items have not been removed.

C. Building Services- Locate, identify, stub-off and disconnect building services that are not indicated to remain. Notify Architect in advance of interruptions. Arrange for temporary relocations and service by-pass as required.

3.02 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations. Comply with Division 01 Section "Photographic Documentation."

D. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

3.03 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.

5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.04 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.05 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

D. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch to match new work.

3.06 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 030500
CRYSTALLINE CONCRETE WATERPROOFING ADDITIVE

PART 1 GENERAL

1.01 SUMMARY

A. This section covers the requirements for waterproofing of the concrete elevator pit slab and walls below grade as indicated on the drawings.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. Army Corp. of Engineers (CRD)

C. American Concrete Institute Reference 308

1.03 SYSTEM DESCRIPTION

A. The concrete waterproofing admixture shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete.

B. The design shall include the use of the crystalline waterproofing repair materials that generate a non-soluble crystalline formation in the concrete.

1.04 STORAGE, DELIVERY AND HANDLING

A. Store manufacturer's sealed and labeled material containers in dry, protected environment off the ground.

1.05 RELATED REQUIEMENTS

A. Section 03 30 00 Cast-In-Place Concrete.

B. Division 07 Section Crystalline Waterproofing for elevator pit concrete additive

1.06 COORDINATION

A. All waterproofing materials shall be purchased from the local distributor with respect to the project.

PART 2 PRODUCTS

2.01 MANUFACTURES

A. Manufactures as approved by the Architect.

2.02 MATERIALS

A. The concrete waterproofing admixture shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete.

B. The design shall include the use of the crystalline waterproofing repair materials that generate a non-soluble crystalline formation in the concrete.

C. The concrete crystalline waterproofing admixture shall be specifically formulated as a concrete admixture.

E. Waterproofing admixture shall meet the performance requirements outlined in Section 2.04.

2.03 MIXES

A. The dosage rate for the admixture shall be 3% by weight of cement.

2.04 PERFORMANCE CRITERIA

A. U.S Army Corps of Engineers CRD C48-73 “Permeability of Concrete” Requirement: No leakage when subjected to pressure of 150 psi for 24 hours. Only 1.5 mm of penetration after 120 hours.

B. U.S Army Corps of Engineers CRD C48-73 “Permeability of Concrete” Requirement: No leakage when subjected to head pressure of 224 feet for 10 days.

C. DIN 1048 “Water Impermeability of Concrete”
   1. Requirement: No water penetration after 28 days under hydrostatic pressure.

D. NSF 61 “Standard Water System Component Health Effects
   1. Requirement: Certified for use in potable water in accordance with ANSI/NSF Std. 61.

E. ASTM C 39 “ Compressive Strength of Cylindrical Concrete Specimens”
   1. Requirement: After 28 days, a minimum of 10% increase in compressive strength.

F. Crack Bridging Capability:
   1. Requirement: Crystalline Waterproofing shall be capable of sealing static cracks up to 1/64”.

PART 3 APPLICATION

3.01 MATERIALS PREPARATION

A. Admixture materials must be added to the concrete at the time of batching. It is recommended that the Admix powder be added first to the rock and sand and blended thoroughly for 2 - 3 minutes before adding cement and water.

B. Blend total concrete mix using normal practices to ensure formation of homogeneous mixture.

C. For precast concrete manufacturers this usually means adding the admixture into their pan type mixers.

D. For ready-mix batch plants the admixture can be evenly distributed on a plant conveyor belt carrying the rock and sand, or the dry powder Admix can be added to the truck first and then 30 - 50% of the required water for the concrete batch is dispensed along with 300 - 500 pounds of aggregate and mixed thoroughly for 2 - 3 minutes. The rest of the materials are then added to the truck and mixed for at least 5 minutes.

3.02 APPLICATION

A. Placement of concrete shall be in accordance with the Section 033000

B. Concrete that contains the admixture must be cured as per "Standard for Curing Concrete" (ACI 308)

C. Normal backfilling procedures may be used after concrete has cured for at least 7 days.

END OF SECTION

SECTION 030516
UNDERSLAB VAPOR BARRIER - STEGO

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.04 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier to be used.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.
   1. Include instructions for placement, seaming and penetration repair.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers or packaging, dry and undamaged, with seals and labels intact and legible.
   1. Labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing.
   2. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above shall be automatically rejected and shall be removed and replaced at Contractor's expense.
   3. Keep combustible materials away from ignition sources.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m2 Pa)), maximum.
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils (0.4 mm).
   4. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
   5. Alternate Manufacturers:
      a. Reef Industries, Inc.; Griffolyn 15-mil: www.reefindustries.com.

b. Fortifiber Building Systems Group; Moistop Ultra 15 Underslab Vapor Retarder 15-mil: www.fortifiber.com.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.
   1. Including but not limited to manufacturer recommended perimeter/edge seams, termination bars and pipe boots as required for a total/complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
   1. Turn barrier membrane up the foundation wall to a minimum height of 6 inch (152 mm) above the outside/exterior grade or in compliance with local building codes and terminate with manufacturer's termination bar. To form a complete seal, apply manufacturer's tape or mastic to the foundation wall prior to installing manufacturer's termination bar. Allow one hour or as recommended by manufacturer, whichever is longer, for manufacturer's mastic to cure prior to installing termination bar.

C. Lap joints minimum 6 inches (150 mm).

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.02 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Pile caps
   3. Grade beams
   4. Foundation walls.
   5. Slabs-on-grade.
   6. Above grade slabs (cast-in-place or on metal decks)
   7. Drilled piers and shafts.

B. This specification section applies to all references in the contract documents to specification section 03 10 00, 03 20 00, or 03 30 00.

C. Related Sections include the following:
   1. Division 31 Section "Earth Moving - Light Site and Building Pad" for drainage fill under slabs-on-grade.
   2. Division 03 Section "Cast-in-Place Architectural Concrete" for general building applications of specially finished formed concrete, if applicable.
   3. Division 03 Section Crystalline Concrete Waterproofing Additive for elevator pit concrete additive.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement. None of the following are allowed in any concrete in this project: fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 SUBMITTALS

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

B. Design Mixtures: Submit a design mixture for each concrete mixture, proportioned on the basis of field experience or trial mixtures, or both, as required by ACI 318-19, chapter 26. Evidence of the ability of the proposed mixture to comply with concrete mixture requirements on the Drawings shall be included. The evidence shall be based on field test records or laboratory trial batches. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amount of mixing water to be withheld for later addition at Project site. The amount of water withheld shall not exceed five percent (5%) of the total batch water.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing but not limited to bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Reproductions made from contract drawings will not be accepted. Submit one (1) electronic print. Review of shop drawings by the Engineer will be for general compliance with contract documents.

D. Field quality-control test and inspection reports.

E. The scope of the above submittals shall only include the items covered by this Section. Do not include items covered by other Sections such as site paving product data, site paving design mixtures, or site paving steel reinforcement shop drawings.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site (with video teleconferencing capabilities) and verify acceptable date with Architect and Engineer a minimum of one week prior to scheduling.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Contact vapor barrier manufacturer for preinstallation meeting and to coordinate review of the vapor barrier installation either by digital review or in person.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs qualified personnel on the Project, Flatwork Technicians with at least three (3) years experience, Finishers with at least three (3) years experience and a Supervisor with at least ten (10) years experience in concrete finishing and flatwork.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specification for Structural Concrete for Buildings,"
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
   3. ACI 318, “Building Code Requirements for Structural Concrete.”

G. Concrete Testing Service: Owner shall engage (and pay for) a qualified independent testing agency to perform material evaluation tests. Contractor shall engage and pay a qualified independent testing agency to design concrete mixtures.

H. Materials and installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials for installed work, shall be done at Contractor’s expense.

I. For all concrete placement events, all steel reinforcement, other embedded items, and formwork shall be set and finalized a minimum of (3) three hours prior to the time of initial concrete placement to allow time for proper observation/inspection by the design team and the testing agency and time for resolution of any discrepancies.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops (if required): Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

A. Forms for Exposed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
      a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Forms for Unexposed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
   1. Form foundation elements as indicated on contract documents (typically placed in general notes of the structural plans).

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips (if required): Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
1. All reinforcing bars to be welded shall be ASTM A706, deformed.

B. Plain-Steel Wire: ASTM A 82.

C. Deformed-Steel Wire: ASTM A 1064.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 1064, flat sheet.

2.03 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars (if required): ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view or weather where legs of wire bar supports contact forms (or occur within 1-1/2 inches of surface), use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use either of the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I/II unless otherwise acceptable to Architect.
2. Blended Hydraulic Cement: ASTM C 595, Type IL (10), 10% limestone substitution.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 1 inch nominal for regular sand and gravel mixtures.
2. Maximum Coarse-Aggregate Size: 0.5 inch nominal for sand and pea gravel mixtures. Use a #8 stone aggregate gradation per ASTM C 33 for pea gravel aggregate.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.

D. Water: ASTM C 94/C 94M and potable. Clean and not detrimental to concrete.

2.05 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.06 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Carlisle Coatings & Waterproofing Inc; MiraSTOP.
      b. CETCO; Volclay Waterstop-RX.
      c. Concrete Sealants Inc.; Conseal CS-231.
      d. Greenstreak; Swellstop.
      e. Henry Company, Sealants Division; Hydro-Flex.
      f. JP Specialties, Inc.; Earth Shield Type 20.

2.07 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape. The vapor retarder shall maintain a permeance of less than 0.01 perms as tested before and after mandatory conditioning tests (per ASTM E 1745 Section 7.1 and sub-paragraphs 7.1.2-5).
   1. Available Products:
      a. Fortifiber Building Systems Group; Moistop Ultra.
      b. Meadows, W. R., Inc.; Perminator. (Perminator HP is not acceptable)
      c. Raven Industries Inc.; Vapor Block.
      d. Reef Industries, Inc.; Griffolyn.
      e. Stego Industries, LLC; Stego Wrap.
      f. Inteplast Group; Barrier-Bac
   2. Refer to contract plan documents for minimum vapor retarder thickness in mils.
   3. Vapor proofing mastic: water vapor transmission rate per ASTM E 96 of 0.3 perms or lower.
   4. Seam tape: must have a water vapor transmission rate of 0.3 perms or lower in accordance with ASTM E 96

2.08 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

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

C. Water: Potable.

D. Curing compounds must be approved for use with types of floor finishes and sealers/hardeners specified in Contract Documents. Curing compound shall not interfere with bonding of floor covering. The following list of compounds does not indicate acceptance with the floor finishes utilized. Contractor shall only submit for approval curing compounds that are guaranteed not to interfere with bonding of any floor covering. Contractor assumes all responsibility for compliance of curing compounds with respect to this requirement.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
   1. Available Products:
      a. Ashford Formula
      b. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.

c. Burke by Edoco; Aqua Resin Cure.
d. ChemMasters; Safe-Cure Clear.
e. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
f. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
g. Euclid Chemical Company (The); Kurez DR VOX.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; Aqua Kure-Clear.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100 Clear.
l. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
m. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
n. Tamms Industries, Inc.; Horncure WB 30.
o. Unitex; Hydro Cure 309.
p. US Mix Products Company; US Spec Maxcure Resin Clear.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.09 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips (if required): ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240. Verify compatibility with flooring and flooring adhesive.

C. Reglets (if required): Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots (if required): Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

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

B. Repair Overlayment (if required): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. The design mixtures for all exterior, exposed concrete shall provide a minimum of 4.5 percent entrained air.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, and concrete required to be watertight.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
   5. If more than one admixture is used in a concrete mix, assure that only compatible admixtures are used.
   6. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

E. Maximum W/C Ratio: 0.50 and as required to achieve specified concrete strength.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Design mixes to provide concrete with the properties as indicated on the structural drawings.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information. The time concrete is unloaded shall be recorded on each batch ticket.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
   2. Batch ticket information shall include information necessary to calculate total mixing water and the amount of water added by the receiver.

B. Project-Site Mixing is not allowed.

PART 3 EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 117 and ACI 347R as abrupt or gradual, as follows:
   1. Class A, 1/8 inch for smooth-formed finished surfaces.
   2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete, unless otherwise indicated.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Verify all foundation and slab edges for coordination with architectural Drawings prior to placement of concrete.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install and secure anchor rods prior to placing of concrete.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   4. Install dovetail anchor slots in concrete structures as indicated.
   5. Provide additional rebar if required to secure rebar dowels in proper location.

B. Do not run any mechanical/electrical/plumbing pipes or conduit horizontally through concrete slabs (ground floor or elevated), unless approved by the Engineer. These items shall also not bear continuously along grade beams and shall only cross perpendicular over top of grade beam in the concrete thickness below the slab at isolated locations.

C. Do not run any mechanical/electrical/plumbing pipes or conduit through concrete footings and/or pile caps, unless approved by the Engineer. All mechanical/electrical/plumbing items shall be routed to avoid conflicts with concrete construction.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength but in no case shall forms be removed sooner than 10 days from placing of concrete for such elements.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
   1. If vapor barrier is installed before the grade beam pour, seal vapor barrier to the inside face of grade beams along the entire vapor barrier perimeter using tape with a surface that creates a mechanical seal to freshly-placed grade beam concrete, per manufacturer's instructions.
   2. If vapor barrier is installed after the grade beam pour, seal vapor barrier to the inside face of grade beams along the entire vapor barrier perimeter using tape and termination bar per manufacturer’s instructions. Ensure the grade beam surface is clean and dry prior to adhering tape.
   3. Lap joints 6 inches and seal with manufacturer's recommended tape.
   4. Repair damaged areas by cutting patches of required vapor retarder, overlapping damaged area 6 inches and taping all four sides with approved tape.
   5. Seal all penetrations (including pipes) per manufacturer’s instructions.
   6. The vapor retarder shall be sealed at the perimeter.

3.05 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Maximum spacing of bar supports for slab/mat reinforcement shall be 48 inches on center or less as required to secure reinforcement during construction operations.

E. Precast concrete blocks shall only be used to support reinforcement from the ground. Concrete blocks shall not be used for support of top reinforcement in concrete slabs or mats.

F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

G. Install bar reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap ends of bars **as indicated on the structural contract drawings.**

H. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces as specified on drawings or a minimum of two full mesh if not otherwise specified. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Do not continue reinforcement through sides of strip placements of floors and slabs (unless noted otherwise on drawings).
   2. Form joints as indicated on drawings. Do not use metal keyways
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Construction joints shall not be placed in any slab areas with floor coverings prone to cracking, unless written approval is provided the Architect. When construction joints are allowed in slab areas with floor coverings prone to cracking, the contractor shall assure that joints are properly considered in floor covering installation as required to prevent reflective cracking.

C. Isolation Joints in Slabs-on-Grade (if required): After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
   2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

D. Doweled Joints (as indicated on drawings): Install dowel bars and support assemblies at joints where indicated.

3.07 WATERSTOPS

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

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.
   1. Place at locations indicated on plans.

2. Place at concrete construction joints below site grade in order to avoid water intrusion into interior space.
    a. Place at wall to slab (or mat foundation) joints below site grade.
    b. Place at wall to wall joints below site grade.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
    1. All embedded items, including anchor bolts, rebar dowels, etc., shall be set prior to placement of concrete.
    2. For foundation elements, verify that water is not present in the excavation prior to placement of concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and in accordance with ASTM C94.
    1. Determine initial slump prior to any water addition at Project site and before any significant concrete discharge.
    2. Measure and record water added on Project site and resulting slump.
    3. The amount of water added shall not exceed the amount allowed in the approved design mixture.
    4. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
    5. Do not exceed specified W/C ratio or slump per approved design mixture.
    6. Do not add water to concrete delivered in equipment not acceptable for mixing.
    7. Do not add water if more than 0.25 cubic yards of concrete has already been discharged from the mixer.
    8. All water added shall be under the pressure and direction of flow required to achieve uniformity in concrete. Immediately after addition of water, the drum or blades of the truck mixer or agitator shall be turned an additional 30 revolutions or more if necessary, at mixing speed, until uniformity of concrete is achieved.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
    1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
    2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
    3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
    1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
    2. Maintain reinforcement in position on chairs during concrete placement.
    3. Screed slab surfaces with a straightedge and strike off to correct elevations.
    4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not place concrete when temperature is 36 deg F or below or if temperature is expected to reach 36 deg F (or below) within 12 hours of the anticipated time for completing a concrete pour.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301, ACI 305R, and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

G. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.09 FINISHING FORMED SURFACES

A. Rough-Formed Finish: (For formed concrete surfaces not exposed to view) As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: (For formed concrete surfaces exposed to view) As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Unless noted otherwise, all exposed concrete surfaces shall receive a rubbed finish. Consult with Project Architect to determine the type of rubbed finish prior to pouring of concrete. Apply one of the following to smooth-formed finished as-cast concrete as indicated or directed by Architect:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General:
1. Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
2. See architectural drawings for slab finish requirements or consult the Project Architect if finishes have not been supplied on the architectural drawings.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated, to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
a. Finish surfaces to the following tolerances, see structural drawings

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
   2. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
   1. Uniformly spread dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
   2. After broadcasting and tamping, apply float finish.
   3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
    1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints, unless noted otherwise in documents. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
    1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Provide special inspections in accordance with Chapter 17 of the International Building Code for concrete construction.

B. Inspections:
1. Steel reinforcement placement.

2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Mixing and delivery time for concrete.
    a. Record the time batched, time arrived, and the time unloaded for each batch of concrete.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
    1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
        a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
    2. Slump: ASTM C 143/C 143M; one test at point of discharge for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change or is questionable.
        a. Determine initial slump prior to any water addition to concrete at Project site and before any significant concrete discharge.
        b. Measure and record water added to concrete on Project site and resulting slump.
        c. Record amount of water indicated on batch ticket allowed to be added.
    3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
    5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    6. Compression Test Specimens: ASTM C 31/C 31M.
        a. Cast and laboratory cure five standard cylinder specimens for each composite sample.
        b. Testing Agency shall be responsible for providing curing container for composite samples on Site as required for initial curing period and verifying that standard-cured composite samples are cured in accordance with ASTM C31/C31M. Testing Agency shall document method of initial curing.
        c. The Contractor shall provide secured space, electrical power, and access for initial curing of test specimens.
    7. Compressive-Strength Tests: ASTM C 39/C 39M.
        a. Test one specimen at 7 days, three specimens at 28 days, and hold one specimen for testing at 56 days, if necessary.
        b. A compressive-strength test shall be the average compressive strength from a set of three specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work (illustrated via highlighting of elements on structural plans), design compressive strength at 28 days, concrete mixture proportions and materials, concrete unit weight, compressive breaking strength, and type of break for both 7- and 28-day tests. Deviations from the requirements of the Contract Documents shall be clearly identified and described on the reports.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness, per requirements on drawings, according to ASTM E 1155 within 72 hours of finishing.

E. Environmental Controls: Rinsing out of the transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in strict conformance with all EPA requirements for the prevention of water runoff to storm water sewers or ditches.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Structural steel.
   2. Field-installed shear connectors.
   3. Grout.

B. Related Requirements:
   1. Division 05 Section “Steel Decking” for field installation of shear connectors through deck.
   2. Division 05 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
   3. Division 09 painting Sections for surface preparation and priming requirements.

1.3 DEFINITIONS

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

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

C. The general contractor is responsible for coordinating the structural steel shop drawing submittal with all other submittals for elements which attach to structural steel or have an effect on structural steel design or detailing. This includes, but is not limited to, elevators, mechanical/electrical equipment, steel joists, pre-engineered metal stairs, railings, medical equipment, suspended partitions, pre-engineered cold-formed metal trusses, sliding doors, suspended lights, glass storefront/curtainwall, roof davits, roll-up doors, guy wire supports, etc. Hold shop drawing production, ordering of material, fabrication, and other work associated with such elements as required until these other submittals are reviewed and approved. Provide separate submittals for these elements as required. Elevator steel shall be provided in a separate submittal. The general contractor shall coordinate between steel supplier and these other suppliers as required. Submit requests for information in advance of shop drawing production as required.

D. Prior to shop drawing production, review contract documents for discrepancies, incomplete information, non-standard connections, or apparent undefined conditions in which additional information or clarification is required. Submit requests for information prior to detailing for shop drawings at these conditions.

E. Verify size of floor/roof shaft openings (for elevators, stairs, mechanical, etc.) with other submittals/trades as required prior to detailing of associated steel framing at these locations.

1.5 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site (with video teleconferencing capabilities).

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include erection plans, sections, elevations, and details.
   2. Include details of cuts, connections, splices, camber, holes, and other pertinent data. Provide details of all non-standard connections not specifically indicated on the drawings for approval. Comply with all AISC minimum edge distance and spacing requirements.
   3. Include embedment Drawings.
   4. Include a layout plan for all embedment plates in concrete/CMU walls at cold-formed metal truss/open web steel joist support points. Layout plan shall be coordinated with approved submittal of cold-formed metal roof trusses/open web steel joists. Layout plan shall be provided in separate submittal as required.
   5. Indicate size, material specification, surface preparation and coating for all members and components.
   6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds when backing bars are to remain. Provide welding process and joint designation for all complete-joint-penetration and partial-joint-penetration welds.
   7. All required field welding shall be indicated on the erection drawings using erection details.
   8. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   9. All column piece drawings shall indicate the grid location of the column.
   10. Reproductions made from contract drawings will not be accepted.
   11. For structural-steel connections indicated to comply with design loads, include structural analysis data by the qualified professional engineer responsible for their preparation.
   12. Shop drawings shall be computer generated using three-dimensional detailing software.
   13. **The final three-dimensional model shall be transmitted electronically to the Engineer along with submittal of shop drawings. Model is provided for information only. All comments from review will be made on 2D shop drawings. The three-dimensional model shall be submitted in IFC (.ifc) format. A three-dimensional model shall also be sent for all pre-engineered metal stairs.**
   14. Allow 21 days for review of structural steel shop drawings, excluding delivery time to and from the contractor.
   15. On projects where submittals are processed electronically, provide Engineer with a minimum of one half-sized copy of shop drawings for office use only.
   16. For shop drawings that are marked “Make Corrections Noted”, provide Architect/Engineer with an electronic record set of the shop drawings and three-dimensional model for informational purposes once all revisions are made.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, “Structural Welding Code – Steel,” for each welded joint qualified by testing, including the following:
   1. Power Source.

D. Delegated-Design Submittal: For structural-steel connection indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Qualification Data: For Installer and fabricator.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with top coats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control test reports.

G. Survey of existing conditions.

H. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

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

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repacking and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturer's written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
1. Select and complete connections using AISC 360.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels: ASTM A 992/A 992M.

C. Angles: ASTM A 572/A 572M, Grade 50.

D. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50.

E. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50.

F. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

G. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.

H. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
   1. Weight Class: Standard, unless otherwise noted on drawings.
   2. Finish: Black, except where indicated to be galvanized.

I. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirements S11.

J. Steel Forgings: ASTM A 668/A 668M.

K. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563, Grade C heavy hex carbon-steel nuts; and ASTM F 436, Type 1 hardened carbon-steel washers; all with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852 (also referred to as ASTM A 325 Tension-Control), Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563, Grade C (or Grade DH if indicated to be galvanized) heavy hex carbon-steel nuts; and ASTM F 436, Type 1 hardened carbon-steel washers.
   1. Finish: Plain, except where indicated to be galvanized.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

D. Threaded and Nutted Anchor Rods (or Anchor Bolts): ASTM F 1554, Grade 55, weldable, straight.
   1. Nuts: ASTM A 563 heavy hex carbon steel.
   2. Plate Washers: ASTM A 36 carbon steel.
   3. Washers: ASTM F 436 hardened carbon steel.
   4. Finish: Plain, except where indicated to be galvanized.

E. Threaded Rods: ASTM A 36
   1. Nuts: ASTM A 563 heavy hex carbon steel.
   2. Washers: ASTM A 36 carbon steel.

F. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.4 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Primer chosen shall be compatible with any additional coatings required.

C. For exposed structural steel, refer to Division 09 sections

D. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 or ASTM A 780.
   1. Dry film shall have at least 94% metallic zinc by weight
   2. Coordinate with Division 09 Sections of field painting if exposed.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
   1. All grout shall have a minimum compressive strength of 5,000 psi at 28 days.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 “Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
   1. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
   2. Mark and match-mark materials for field assembly.
   3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces. Do nut thermally cut bolt holes in the field or enlarge holes by burning.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
   1. Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes in the field or enlarge holes by burning.
   2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Pretensioned.
   2. Use standard bolt holes. Slotted holes are not permitted unless indicated.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth for architecturally exposed structural steel members
   2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC 303 for mill material.
   3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
      a. Grind butt welds flush.

b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

4. All flare bevel groove welds shall be filled flush with top of round surface, unless noted otherwise.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches. This does not apply to columns.
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials. This does not apply to intumescent coatings.
   5. Galvanized surfaces.
   6. Top flanges of composite steel beams that are specified to have headed shear studs attached.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

E. All structural steel shall be prepared in manner compatible with architectural requirements such as intumescent coatings, applied fire-proofing, high performance coatings, etc. Coordinate to verify compatibility between products chosen and/or methods of preparation. Identify any conflicts to Architect prior to fabrication of structural steel.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
   1. Fill vent holes and grind smooth after galvanizing.
   2. Galvanize steel lintels and shelf angles attached to structural frame and located in exterior walls.
   3. Galvanize steel exposed to weather, U.N.O.
   4. Galvanize all other steel specifically indicated on Drawings.
   5. Galvanize all anchor bolt assemblies for steel members outside building enclosure.
   6. Galvanized anchors and nuts shall be purchased from same supplier and shall be shipped preassembled.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Contractor shall hire independent Testing Agency for inspection of shop welds and bolts at production facility. Owner's Testing Agency shall provide additional inspection of shop welds and bolts upon arrival to jobsite.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1 and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

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

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

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

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
4. All grout shall be placed under steel column base plates and achieve 70% of its required 28-day strength prior to placement of concrete for elevated floors which are supported by the steel columns.
5. Grout shall be placed with fluid consistency if column blockouts are used at ground floor slab.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC 303, “Code of Standard Practice for Steel Buildings and Bridges." Acceptable tolerances shall be reduced as required to comply with the details and other requirements indicated by the Contract Documents.

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. Do not cut holes in structural steel framing unless indicated on structural drawings.

J. Headed Stud Anchors: Prepare steel surfaces as recommended by manufacturer of headed stud anchors. Use automatic end welding of headed stud anchors according to AWS D1.1 and manufacturer's written instructions. Welding shall develop full capacity of headed stud anchor.

K. All structural steel diagonal brace members shall be set and attached to the steel frame prior to placement of concrete for elevated floors.

L. Remove all factory piece markings (especially if welded on to the member) by grinding smooth on all elements to be exposed prior to field painting.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Pretensioned
2. Provide and install a tension-control, high-strength bolt-nut-washer assembly for all bolts on field bolted connections.
3. Use standard bolt holes. Slotted holes are not permitted unless indicated.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth for architecturally exposed structural steel connections.
   3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
   4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
      a. Grind butt welds flush.
      b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
   5. All flare bevel groove welds shall be filled flush with top of round surface, unless noted otherwise.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.
   4. Verify all other applicable items as required per Chapter N of AISC 360.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspection.

C. All inspection and tests shall be performed in accordance with Chapter N of AISC 360.

D. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Welded Connections: Visually inspect field welds according to AWS D1.1. See structural drawings for additional requirements on weld inspection.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1 and the following inspection procedures, at testing agency's option or as specified on structural drawings:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

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

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
   1. All corrections shall be submitted to the Project Architect and Engineer for review and approval. Correction work shall not proceed until approval has been provided.

2. Significant deficiencies in construction which require substantial engineering to resolve may require the contractor to secure the services of a professional engineer at no additional cost to the owner. The Project Architect and/or Engineer of Record will determine if a contractor hired engineer is required depending on the severity of the deficiency and the extent of work involved.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780 and manufacturer's written instructions.

B. Touchup Priming: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
   2. Remove all factory piece markings (especially if welded on to the member) by grinding smooth on all elements to be exposed prior to field touchup priming operations. Touchup prime all repaired spots that required field grinding and cleanup which damaged the shop priming.

C. Touchup Painting: Cleaning and touchup painting for exposed steel are specified in Division 09 painting Sections.

3.7 MISCELLANEOUS STEEL

A. Unless otherwise indicated on the structural drawings, provide angles, tubes, plates, channels, and other steel members shown on the architectural and connect with 1/4" fillet weld at all material interfaces. It is the contractor’s responsibility to coordinate and verify all structural steel shapes indicated in architectural drawings, prior to bid.

END OF SECTION

SECTION 053100
STEEL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Composite floor deck.

B. Related Requirements:
   1. Division 03 Section "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Division 05 Section "Structural Steel" for shop- and field-welded shear connectors.
   3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Division 09 painting Sections for repair painting of primed deck and finish painting of deck.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Reproductions made from contract drawings will not be accepted. Submit one (1) electronic print. Review of shop drawings by the Architect/Engineer will be for general compliance with contract documents.
   1. Include plans showing layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
   2. Steel decking shop drawings shall not be submitted until structural steel framing shop drawings have been reviewed.

1.04 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Canam Steel Corporation.
   2. Epic Metals Corporation.
   3. New Millennium Building Systems, LLC.
   4. Nucor Corp.; Vulcraft Group. (design basis on structural plans)
   5. Valley Joist.
   6. DACS, Inc.
   7. Cordeck.
   8. Consolidated Systems, Inc.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50 (minimum yield stress in ksi), G60 zinc coating. At all exposed conditions, galvanized deck shall cleaned, pretreated, and primed with manufacturer’s standard baked-on, rust-inhibitive primer. Verify compatibility with top coat specified by Architect.
   2. Deck Profile: As indicated.
   3. Profile Depth: As indicated.
   4. Design Uncoated-Steel Thickness: As indicated.
   5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
   6. Span Condition: Triple span or more unless not permitted by geometry.
   7. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Canam Steel Corporation.
   2. Epic Metals Corporation.
   3. New Millennium Building Systems, LLC.
   4. Nucor Corp.; Vulcraft Group. (design basis on structural plans)
   5. Valley Joist.
   6. DACS, Inc.
   7. Cordeck.
   8. Consolidated Systems, Inc.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50 (minimum yield stress in ksi), G60 zinc coating. At all exposed conditions, the top surface of galvanized deck shall be unpainted and underside surface shall be cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer. Verify compatibility with top coat specified by Architect.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: Triple span or more unless not permitted by geometry.

2.04 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Fasteners indicated on plans as "Tek Screws" shall be self-drilling tapping screws complying with the material, process, and performance requirements of ASTM C1513. Tek screws shall be corrosion resistant and meet the minimum requirements of ASTM F1941. Provide larger screws if required for attachment to structural steel. Provide screws penetrating joined members by not less than three exposed screw threads

E. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

F. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

J. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

K. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

L. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

M. Galvanizing Repair Paint: ASTM A 780.

N. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work. See structural drawings for 12 gage reinforcement plate required at small openings in the deck.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Deck fasteners shall be in accordance with structural contract drawings.

3.03 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members as indicated on the plans.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels as indicated on the plans.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 4 inches apart with at least one fastener at each corner.
   1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members as indicated on the plans.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels as indicated on the plans.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum at non-composite deck. Butted at centerline of support at composite deck (1/2" maximum gap).

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
   1. Girder filler shall be provided on both sides of composite girder beams (spanning parallel to composite deck span) to ensure full concrete coverage over top flange of girder beam.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck. Continuous closure pieces shall be cut at deck valleys as deemed necessary by Engineer.

F. Provide shoring of floor deck if indicated on Drawings.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and inspections shall be performed in accordance with SDI-QA/QC "Standard for Quality Control and Quality Assurance for Installation of Steel Deck."

C. Field welds will be subject to inspection.

D. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

G. Prior to placement of roofing material over metal roof deck, the Contractor shall notify Testing Agency to perform inspection of roof deck fastening to supporting elements. Roofing material shall not be placed until inspection results are reviewed by Architect and all corrective work is complete.

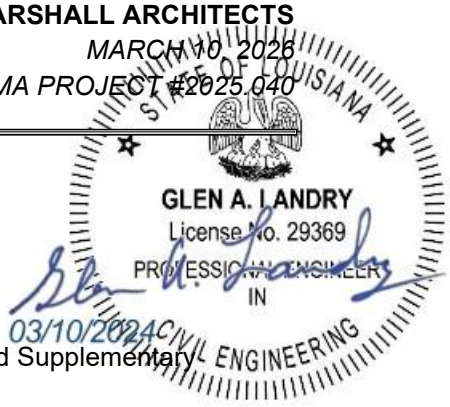
3.06 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 3100



SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Exterior non load-bearing wall framing (Delegated design. See Performance Requirements).
   2. Exterior soffit framing (Delegated design. See Performance Requirements).

B. This specification section applies to all references in the contract documents to specification section 05 41 00 as well as section 05 40 00.

C. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads shown in plans and for resisting wind pressures determined from the wind speeds, exposure and risk category provided on plans.
   1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height for walls supporting brick/masonry veneer. Horizontal deflection of 1/360 of wall height for all other walls. Ultimate wind loads may be multiplied by 0.42 as allowed by IBC for purposes of wall deflection limits.
      b. The above deflection limits apply at all spans of the framing member, including cantilever spans and overhangs.
   2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 3/4 inch.
   4. Design cold-formed framing systems to withstand any design loads and forces acting onto the cold-formed framing systems from any storefront/glass assemblies. Proper consideration of point loads from mullions shall be indicated in the design calculations.
   5. Design cold-formed framing systems to accommodate connections of any storefront/glass assemblies.

6. All framing conditions which preclude the complete usage of cold-formed metal framing as indicated on the construction documents shall be identified prior to bidding or be resolved after bidding at no additional cost to the owner. Provide fixed connections to the structure where required for stability at cantilever conditions. Connections to structure shall be designed and provided by cold-formed metal framing supplier. Only provide fixed connections to structure when required for stability. Do not add kicker braces to reduce the span length of exterior wall studs. Do not attach to bottom flange of steel beams unless indicated on structural drawings.
7. Design all exterior soffit ceilings to resist positive and negative wind pressure in accordance with ASCE 7. Design soffit framing for dead weight of soffit and for a vertical construction live load of 10 psf minimum and a simultaneous 300 pound point load where erector can stand and otherwise load such framing.
8. Design interior wall framing for a net horizontal differential pressure of 5 psf perpendicular to the wall surface (in either direction) due to differential interior air pressure between rooms and incidental loading.
9. Coordinate all loading at attachments between cold-formed metal stud framing and cold-formed metal roof truss framing, where applicable.
10. Thickness of cold-formed metal framing shall be minimum required for anchorage at all louvers, doors, windows, and other wall openings. Coordinate with applicable supplier for minimum thickness of material for anchorage at framed wall openings.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.04 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work. Layout for metal stud wall framing shall include building elevations and/or wall plans indicating applicable wall sections in shop drawings. Provide wall sections for all unique exterior wall framing conditions around perimeter of building, including applicable locations where sections have not been provided in contract drawings. Contact Architect/Engineer prior to submittal of Shop Drawings if any additional information is required.
   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Submit shop drawings, sealed and signed by a qualified Louisiana Registered Civil Engineer.
      a. Shop drawings shall be computer generated using two-dimensional drafting software (minimum).
      b. Shop drawings (and all other information necessary for field construction) shall be on completely separate sheets from structural analysis data (calculations).
   3. Allow 21 days for review of cold-formed metal framing shop drawings, excluding delivery time to and from the contractor.

4. For shop drawings that are marked “Mark Corrections Noted”, provide Architect/Engineer with an electronic record set of the shop drawings for informational purposes once all revisions are made.
5. Do not submit shop drawings prior to review and approval of storefront/glass assembly submittals and pre-engineering metal building submittals.

C. Welding certificates (if any welding is required).

1.05 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

I. The general contractor is responsible for coordinating with the cold-formed metal framing Design Engineer to ensure the metal framing is installed in accordance with the approved shop drawings. The Architect/Engineer is not responsible for verifying proper installation of cold-formed metal framing.

J. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Framing Alliance, or the Steel Stud Manufacturers Association.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

C. It is the responsibility of the General Contractor and Sub-Contractor to ensure that fabricated trusses shall be handled, stored and installed in such a manner that they are not subjected to damage. If it is necessary to store trusses prior to installation, the trusses must be stored in a vertical position with adequate bearing points and bracing to prevent warping and or racking. Proper handling, safety precautions, and other procedures consistent with good installation practices must be observed by all sub-contractors and their employees.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing, not including pre-engineered roof trusses, by one of the following:
1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkDietrich Building Systems
4. Consolidated Fabricators Corp.; Building Products Division.
5. Custom Stud, Inc.
6. Marino\Ware; a division of Ware Industries.
7. SCAFCO Corporation.
8. Steel Construction Systems.
9. Steeler, Inc.
10. United Metal Products, Inc.
11. Super Stud Building Products, Inc.
12. Telling Industries
13. US Frame Factory

2.02 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G90.

C. Screws: All screws used in the manufacture of steel roof trusses shall be exterior rated zinc coated

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
2. Minimum Flange Width: 1-5/8 inches.
3. Section Properties: As required by design. See drawings for required depth of wall.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428.
2. Minimum Flange Width: 1-1/4 inches.
3. Section Properties: As required by design. See drawings for required depth of wall.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
   2. Flange Width: 1 inch plus the design gap for 1-story structures.
   3. Section Properties: As required by design. See drawings for required depth of wall.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
      b. Minimum Flange Width: 1 inch plus twice the design gap.
      c. Section Properties: As required by design. See drawings for required depth of wall.
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
      b. Minimum Flange Width: width equal to the sum of outer deflection track flange width plus 1 inch.
      c. Section Properties: As required by design. See drawings for required depth of wall.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.04 EXTERIOR SOFFIT FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0329 inch.
   2. Minimum Flange Width: 1-5/8 inches.
   3. Minimum section: as required structurally or as specified on plans. See drawings for maximum allowed depth of element.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.

9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout (if required): Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout (if required): Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims (if required): Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets (if required): Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.08 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
   4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction that out of tolerance.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations where required by Architect.

3.03 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

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

K. Exterior Soffit Framing: Provide horizontal and vertical members as required for support of all exterior soffit ceilings. Vertical members shall be provided at all structural steel beam and open web steel joist locations to uniformly distribute weight and loading of soffit ceiling to structure above. Vertical members may attach to underside of composite-concrete metal decks where required and the attachments shall made be such that a line load is imposed perpendicular to the deck span direction. Vertical members shall not attach directly to non-composite concrete metal floor decks and metal roof decks. All attachments to open web steel joists shall be made at each panel point location. All kickers shall only be provided between metal stud framing member where required for stability and without interfering with other work or requirements indicated by the drawings. Kicker brace configurations shall not induce torsion or twisting into floor beams or joists and attachments shall be made for direct transfer of horizontal to floor or roof deck, where required for stability.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Maximum Stud Spacing: 16 inches, or as indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. At Contractor’s option, single or double deflection tracks may be used.
   2. Install single deflection track and attach to building structure.
   3. Install double deep-leg deflection tracks and anchor outer track to building structure.
   4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 72 inches apart. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system. Provide miscellaneous framing and connections as required for support of all masonry veneer, cast stone bands, and other wall covering elements.

3.05 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

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

3.06 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Shop fabricated steel items.

B. Downspout boots.

1.03 RELATED REQUIREMENTS

1.04 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

N. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

Q. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit specification and installation recommendations for manufactured products furnished under this Section, including paint products and grout. List items by manufacturer name and brand name or catalog number.

C. Design Calculations: For items specified to meet performance criteria, provide structural data to demonstrate compliance with requirements. Data shall be sealed and signed by a professional structural engineer licensed by the State of Louisiana to provide this type of engineering.

D. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
      a. Include the following, as applicable:
         1) Design criteria.
         2) Member sizes and gauges.
         3) Details of connections.
         4) Support reactions.
         5) Bracing requirements.

E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

F. Designer's Qualification Statement.

G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.06 QUALITY ASSURANCE

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

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, imbeds, curbs and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.09 WARRANTIES

A. Unless stated otherwise in this specification section, manufacturer's/fabricator's standard warranty regarding manufacturing/fabricating defects in materials, factory finishes, and workmanship for a period of one (1) year from the date of Substantial Completion. Should a product fail to function in normal use within this period, manufacturer/fabricator shall furnish a replacement or new part at manufacturer/fabricator discretion. Failure to use product in methods consistent with manufacturer's/fabricator's product manuals shall relieve manufacturer/fabricator of any liability. Our liability under this warranty excludes installation or removal costs involved in the product replacement and excludes any responsibility for incidental or consequential damage of any nature.

B. Prefabricated Stair Nosings:
   1. Submit manufacturer’s warranty that materials furnished will perform as specified for a period of not less than one (1) year when installed in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Chain Link Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 9 gauge, 0.1483 inch (3.8 mm) thick, top selvage knuckle end closed, bottom selvage knuckle end closed. System to include all associated components for a complete installation.

F. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.

G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; prime paint finish.

D. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

E. Exterior Stair Guardrail/Wall Assembly. Attached to existing structural concrete as noted on Drawings. Assembly to support chain link screen system as shown on Drawings. Provide all components required for a coAll items associated with this system are to be galvanized.

2.04 DOWNSPOUT BOOTS

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.
   6. Characteristics:
      a. Angle at Discharge: 45 degrees.
      b. Length: 36 inch (914 mm).
   7. Manufacturers:
      a. Barry Pattern & Foundry; B25D: www.barrycraft.com.
      b. Downspoutboots.com, a division of J. R. Hoe & Sons; ____: www.downspoutboots.com/#sle.
      c. Neenah; R-4926-29 Series: www.nfco.com.

2.05 FINISHES - STEEL

A. Comply with NAAMM - "National Association of Architectural Metal Manufacturers" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.

B. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

C. Prepare surfaces to be primed in accordance with SSPC-SP2.

D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

E. Prime Painting: One coat.

F. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating. (Provide minimum 530 g/sq m galvanized coating.)
   1. Where exposed to elements.

G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

1. Where exposed to elements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.

C. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.

D. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.02 PREPARATION

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

B. Supply setting templates to the appropriate entities for steel items required to be set for anchoring to metal stud/gypsum board partition system.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated on shop drawings.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

D. CLEANING
   1. Clean exposed surfaces as recommended by the manufacturer.

E. PROTECTION
   1. Upon completion of installation, contractor to protect the finished work from damage by work of other sections during the remainder of construction.

2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 055133
METAL LADDERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Prefabricated ladders.

1.03 RELATED REQUIREMENTS

A. Section 055213 - Pipe and Tube Railings.

B. Section 099123 - Interior Painting: Paint finish.

1.04 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

P. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.06 QUALITY ASSURANCE

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

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.

E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, plain.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches (9 by 50 mm) members spaced at 20 inches (500 mm).
   2. Rungs: One inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
   3. Space rungs 7 inches (175 mm) from wall surface.

2.04 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Carbon steel; ASTM A1011/A1011M Grade 36, minimum.
   3. Finish: Manufacturer's standard hot-dipped galvanizing; comply with ASTM A153/A153M.
   4. Manufacturers:
      a. Alaco Ladder Company; 561 Series Fixed Wall Ladder: www.alacoladder.com/#sle.
      b. A-Mezz Industrial Structures, LLC.; Standard Fixed Ladder (Series FLS): www.amezz.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

2.05 FINISHES - STEEL

A. Prime paint steel items.
   1. Do not prime surfaces in direct contact with concrete.
   2. Do not prime surfaces where field welding is required.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating. (Provide minimum 530 g/sq m galvanized coating.)

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Free-standing railings at steps.
   1. At loading dock steps and ramp.

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 042000 - Unit Masonry: Placement of anchors in masonry.

C. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

D. Section 099113 - Exterior Painting: Paint finish.

E. Section 099123 - Interior Painting: Paint finish.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. AISC 207 - Standard for Certification Programs; 2025.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

I. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017, with Amendment (2021).

J. AWS C3.4M/C3.4 - Specification for Torch Brazing; 2016.

K. AWS C3.5M/C3.5 - Specification for Induction Brazing; 2016, with Amendment (2017).

L. AWS C3.9M/C3.9 - Specification for Resistance Brazing; 2020.

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

N. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Include plans, elevations, sections, details, and attachments to other work. Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State having jurisdication responsible for their preparation.
3. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
4. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.06 QUALITY ASSURANCE

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

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications:
1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.
2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.
1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
2. Intermediate Rails: 1-1/4 by 1 inch (32 by 25 mm) rectangular.
3. Posts: 1-1/2 inches (38 mm) square.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete, for welding anchors.
2. For anchorage to masonry, provide brackets to be embedded in masonry, for welding anchors.
3. For anchorage to stud walls, provide backing plates, for welding anchors.
4. Posts: Provide adjustable flanged brackets.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

F. Grout and Anchoring Cement: Factory-packaged, non-conductive master-flow 648 CP Plus epoxy grout by BASF Building Systems, Custom Building Products or prior approved equal. Install per manufacturer's recommendations.

G. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

H. Provide mechanical and welding fittings where indicated to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

I. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
   1. Ease exposed edges to a small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
      b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
   3. Brass/Bronze Brazed Joints:
      a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
      b. Perform induction brazing in accordance with AWS C3.5M/C 3.5.
      c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

2.02 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Straight Splice Connectors: Steel concealed spigots.

F. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Fully galvanized assembly.
   2. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

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

2.03 FABRICATION

A. General: Fully welded assembly as reasonably possible.

B. Accurately form components to suit specific project conditions and for proper connection to building structure.
   1. Form work true to line and level with accurate angles and surfaces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Fit and shop assemble components in largest practical sizes for delivery to site.

E. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

F. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Interior Components: Continuously seal joined pieces by continuous welds.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Weld connections that cannot be shop welded due to size limitations.
1. Weld in accordance with AWS D1.1/D1.1M.
2. Match shop welding and bolting.
3. Clean welds, bolted connections, and abraded areas.
4. Touch up shop primer and factory-applied finishes.
5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

I. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

J. Obtain fusion without undercut or overlap.

K. Remove flux immediately.

L. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

B. Install in accordance with manufacturer's instructions.
1. And reviewed shop drawings.

C. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
1. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

D. Install railings in compliance with ADA Standards for accessible design at applicable locations.

E. Anchor railings securely to structure.

F. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

G. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

H. Anchor railing as indicated on the drawings and to comply with all loads and codes.

I. Adjusting and Cleaning:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
   2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 057300
DECORATIVE METAL RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Railing systems.
   1. Where indicated on Drawings.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. AISC 207 - Standard for Certification Programs; 2025.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.

E. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2021.

F. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

K. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017, with Amendment (2021).

L. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

M. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section. Attendees include:
   1. Contractor.
   2. Manufacturer's representative.
   3. Architect.
   4. Owner's representative.
   5. Other subcontractors of adjacent work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

C. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include design engineer's seal and signature on each sheet of shop drawings.

D. Samples: Submit one of each item below for each type and condition shown.
   1. Railing: 12-inch (305 mm) long section of each railing member, including top rails and posts; show color, finish, and connection details.
   2. Samples for Initial Selection: For products involving selection of color, texture, or design.

E. Delegated Design Documents: Drawings and calculations sealed by Designer.

F. Test Reports: Submit test reports from independent testing agency showing compliance with specified design and performance requirements.

G. Manufacturer's Instructions: Indicate installation.

H. Designer's qualification statement.

I. Manufacturer's qualification statement.

J. Fabricator's qualification statement.

K. Welders' qualification statement.

L. Installer's qualification statement.

M. Maintenance Data: Manufacturer's instructions for care and cleaning.

N. Specimen warranty.

O. Executed warranty.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

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

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

D. Fabricator Qualifications: Certified in accordance with AISC 201 and IAS AC172.

E. Installer Qualifications:
   1. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.

F. Welder Qualifications: Welding processes and welding operators certified in accordance with AWS B2.1/B2.1M within 12 months of scheduled welding work.

G. Templates: Supply installation templates, reinforcing, and required anchorage devices.

1.07 MOCK-UPS

A. Provide mock-up of railing system and guardrail, one continuous bay long by width indicated on the drawings, indicating each type of material, cladding, and finish.

B. Locate where directed.

C. Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

D. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in factory-provided protective coverings and packaging.

B. Protect materials against damage during transit, delivery, storage, and installation at site.

C. Inspect materials upon delivery for damage. Replace damaged items.

D. Prior to installation, store materials and components under cover in dry location.

1.09 FIELD CONDITIONS

A. Ambient Conditions:
   1. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C).
   2. Maintain ambient temperature of space at minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C) for 24 hours before, during, and after railing installation.

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

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 1-year warranty against defects in materials, fabrication, finishes, and installation commencing on mm-dd-yyyy; complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Rail Infill:
   1. American Stair; Standard Rails: www.americanstair.com/#sle.
   2. American Structures & Design; Round Top TR100 with Picket and Perforated Mesh Infill: www.americanstructures.com/#sle.
   3. Hollaender Manufacturing Company/ Architectural Railing Systems; Speed-Rail Railing System with Metal Infill Panels w/ Quick Connect Kit: www.hollaender.com/#sle.

2.02 RAILING SYSTEMS

A. General: Factory- or shop-fabricated to suit project conditions, for proper connection to building structure, and in largest sizes practical for delivery to site.

B. Performance Requirements:
   1. Comply with ADA Standards.

C. Performance Requirements: Applying loads simultaneously not required; design and fabricate railings and anchorages to resist loads without failure, damage, or permanent set, including:
   1. Lateral Force: 75 lb (333 N) minimum, when tested in accordance with ASTM E935.
   2. Distributed Load: 50 lbf/ft (8756 N/m) minimum, applied vertically and horizontally at top of handrail, when tested in accordance with ASTM E935.
   3. Concentrated Loads: 200 lb (888 N) minimum, applied to handrail horizontally and vertically, in accordance with ASTM E935.

D. Assembly: Use slip-on, nonweld mechanical fittings, flanges, escutcheons, and wall brackets to join lengths, seal open ends, and conceal exposed mounting bolts and nuts.

E. Joints: Machined smooth with hairline seams; tightly fitted and secured.

F. Field Connections: Provide sleeves to accommodate site assembly and installation.

G. Metal Railing: Engineered, post-supported railing system with metal infill.
   1. Configuration: Guardrail with separate handrail.
   2. Top Rail: 1-1/2-inch IPS / 1.9-inch OD (38.1 mm IPS / 48.26 mm OD) diameter aluminum or steel pipe or tube, Schedule 40.
   3. Grip Rail: Round, aluminum or steel, 1-1/2-inch IPS / 1.9-inch OD (38.1 mm IPS / 48.26 mm OD) diameter, Schedule 40.
   4. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
   5. Wall-Mounted Components: Support railing with 1-1/2-inch (38 mm) clearance from wall using the following:
      a. Underslung Support Brackets: Supports at 60 inches (1524 mm), maximum.
      b. Wall Return without Support: Terminates 1/4 inch (6 mm) from side wall.
   6. Handrail Brackets: Same metal as railing.
   7. Fasteners: Concealed.
   8. Infill at Picket Railings: Vertical pickets, where indicated.
      a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
      b. Material: Aluminum tube or solid steel bar.
      c. Shape: Round.
      d. Size: 1/2 inch (38 mm).
      e. Top Mounting: Mechanically attached to internal fittings or welded.
      f. Bottom Mounting: As indicated on drawings.
   9. Infill at Mesh Railings: Metal mesh panels, where indicated.
      a. Metal Infill Panels: Welded wire mesh; 1/8-inch (3 mm) diameter steel wire, 2- by 2-inches (51 by 51 mm) pattern and 1/8-inch (3 mm) thick steel sheet hem with manufacturer's standard factory-applied coating.
      b. Carbon Steel Panel Finish: Manufacturer's standard factory finish; comply with AAMA 2604.
      c. Mounting: Manufacturer's recommended welded or mechanical.
   10. End and Intermediate Posts: As shown on drawings.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Mechanically attached.

H. Wall-Mounted Handrail:
   1. 1-1/4-inch IPS / 1.66-inch OD (31.8 mm IPS / 42.16 mm OD) aluminum, natural finish.
   2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
   3. Handrail Brackets: Manufacturer's standard aluminum brackets.
      a. Mounting: Wall.
      b. Finish: Clear anodized.
   4. Comply with ADA Standards.

2.03 MATERIALS

A. Stainless Steel Components: ASTM A666/A666M, Type 304.
   1. Stainless Steel Tubing: ASTM A554, Type 304, 16-gauge, 0.0625-inch (1.59 mm) minimum metal thickness, 1-1/2-inch (38 mm) diameter.
   2. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

2.04 FABRICATION

A. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.

1. Ease exposed edges to small uniform radius.
2. Welded Joints:
   a. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.

2.05 FINISHES

A. General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions, and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.

B. Stainless Steel Finishes:
   1. Remove tool marks, die marks, and stretch lines before finishing.
   2. Dull Satin: No.6.

2.06 ACCESSORIES

A. Nonweld Mechanical Fittings for Stainless Steel Railings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.

C. Anchors and Fasteners: Provide anchors, fasteners, and other attachment devices required to attach to structure.
   1. Provide attachment devices of same material as components.
   2. Stainless Steel Fasteners: Type 304.
   3. Exposed Fasteners: Not allowed.
   4. Posts: Provide adjustable flanged brackets.

D. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015-inch (0.4 mm) dry film thickness per coat.

E. Sealant: Silicone; black.

F. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions are corrected.

3.02 PREPARATION

A. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions, and directions for installation of anchorages and fasteners.

B. Clean surfaces to receive railings. Remove materials and substances detrimental to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Clean welds, bolted connections, and abraded areas.

F. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, noncumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Test railings for structural performance in accordance with ASTM E935.

C. Nonconforming Work: Repair nonconforming work and retest until work complies with specified requirements.

D. Manufacturer Services: Provide services of manufacturer's field representative to observe railing installation.

3.06 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage material or finish.

3.07 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed, making finishes indistinguishable from undamaged areas.

C. Replace finishes and components that have irreparable damage. Ensure damaged areas are indistinguishable from undamaged finishes and surfaces.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Nonstructural dimension lumber framing.

B. Roof-mounted curbs.

C. Roofing nailers.

D. Roofing cant strips.

E. Preservative treated wood materials.

F. Fire retardant treated wood materials.

G. Communications and electrical room mounting boards.

H. Concealed wood blocking, nailers, and supports.

1.03 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

B. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.04 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

C. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

E. PS 1 - Structural Plywood; 2023.

F. PS 20 - American Softwood Lumber Standard; 2025.

G. SPIB (GR) - Standard Grading Rules; 2021.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and

other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

2. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
1. Grade: No. 2.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

B. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

A. Metal and Finish of Fasteners:
1. Untreated Wood: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and _____.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide nonstructural framing and blocking to support the following:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.

8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Other wall- or ceiling-mounted items indicated on drawings.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

B. Size and Location: As indicated on drawings.

3.07 SITE-APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
   1. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.09 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

3.10 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 071613
POLYMER MODIFIED CEMENT WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Polymer modified cement waterproofing.

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete to be waterproofed.

1.04 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.

B. ASTM C666/C666M - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing; 2015.

C. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Details of joints and intersections.

C. Certification: Provide manufacturer's certification that waterproofing to be provided is suitable for the purpose specified and the locations where it is intended to be installed and that the requirements of Contract Documents do not preclude satisfactory installation and performance.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Maintenance Data: Instructions for care and repair of damaged coatings.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of documented experience and approved by manufacturer.

1.07 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide a mock-up for evaluation of surface preparation techniques and application workmanship in area coordinated with Architect.

C. Locate where directed.

D. Do not proceed with remaining work until workmanship, color, and texture are approved by Architect.

E. Refinish mock-up area as required to produce acceptable work.

F. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Keep stored products dry; store under cover and elevated above grade.

1.09 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polymer-Modified Cement Waterproofing:
   1. The Euclid Chemical Company; Tamoseal, cement-based waterproofing treatment: www.euclidchemical.com/#sle. **BASIS OF DESIGN**.
   2. Sika Corporation; Sikagard Flex Coat System: usa.sika.com/#sle.
   3. W. R. Meadows, Inc; CEM-KOTE BARRIER COTE 100: www.wrmeadows.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.
      a. As approved by Architect.

2.02 MATERIALS

A. Polymer-Modified Cement Waterproofing for Traffic Surfaces: Slurry coating of Portland or hydraulic cement, aggregates, polymer admixtures, and water; no solvents; for application directly to cementitious substrate.
   1. Explicitly recommended by manufacturer as waterproofing, not simply as dampproofing.
   2. Explicitly approved by manufacturer for light pedestrian traffic.
   3. Requiring green concrete cure time of not more than 28 days.
   4. Elongation at Failure: 20 percent, minimum, when tested in accordance with ASTM D412.
   5. Water Vapor Transmission: Minimum permeance of finished coating of 1 perm (57 ng/Pa s sq m), when tested in accordance with ASTM E96/E96M.
   6. Freeze-Thaw Durability: No change when tested in accordance with ASTM C666/C666M for 300 cycles.
   7. Compressive Strength: 5,000 psi (34 MPa), minimum, at 28 days, when tested in accordance with ASTM C109/C109M.
   8. Finished Coating Thickness: As recommended by manufacturer for the specific application but not less than 1/16 inch (1.6 mm).
   9. Color: Cement gray.

B. Crack Repair Material, Joint Tape, and Reinforcing: Type and application as recommended by waterproofing manufacturer.

C. Water: Clean, clear, non-alkaline potable water, free of salts and other harmful elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces where waterproofing is to be applied for conditions detrimental to satisfactory performance.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Remove defective concrete and rebuild to original profiles.

B. Plug active leaks according to waterproofing manufacturer's instructions.

C. Patch holes and non-moving cracks and joints.

D. Clean and prepare surfaces thoroughly prior to installation; schedule cleaning and preparation so that residue will not fall on newly coated, uncured surfaces.

E. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Use sandblasting, water blasting, or acid etching as recommended.

F. Application of waterproofing constitutes acceptance of substrates.

G. Protect other work from fallout, overspray, and spatter from waterproofing application; provide temporary enclosures and covers as necessary to do so.

3.03 INSTALLATION

A. Install waterproofing in accordance with manufacturer's instructions and recommendations unless more stringent requirements are indicated.

B. Perform installation only during ambient and substrate conditions recommended by manufacturer; provide temporary enclosures and/or temporary heating as necessary to do so.

C. Fill voids and holes prior to application of first coat.

D. Apply the number of coats and at the rates recommended by manufacturer for the specific application but not less than specified minimum thickness; apply at least two coats unless one coat is specifically indicated.

E. At surfaces exposed to view, apply a uniformly textured finish without major variations in appearance.

F. Extend waterproofing to all surfaces in areas indicated to form continuous waterproofed surfaces.
   1. At horizontal surfaces, extend waterproofing down and into pits, sumps, trenches, and similar features and up and onto curbs, bases, stair risers, and similar features.
   2. At floors where walls are not treated, extend waterproofing a minimum of 12 inches (300 mm) up walls and columns.

G. Cure waterproofing by recommended methods for recommended period prior to making waterproofed area available for use or occupancy; protect from too rapid drying, severe weather exposure, and water accumulation.
   1. Hot, Dry Weather: Use wet-cure methods regardless of manufacturer's instructions.
   2. Do not use covers that could stain waterproofing surfaces.
   3. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.

4. Do not expose waterproofing to sunlight for minimum of 72 hours after placement.

H. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Flood test waterproofing application by filling to capacity and allowing to stand for not less than 24 hours.

C. If any leaks appear, notify Architect and drain.
   1. Repair leaks at no additional cost to Owner.
   2. Repeat flood test until all leakage is eliminated.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 071616
CRYSTALLINE WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Crystalline waterproofing.

B. Liquid waterproofing admixtures.

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete to be waterproofed.

1.04 REFERENCE STANDARDS

A. ASTM C157/C157M - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete; 2017.

B. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method); 2021.

C. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.

D. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

E. UL (DIR) - Online Certifications Directory; Current Edition.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Test data showing hydraulic permeability.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.
   5. Details for waterproofing at joints, intersections, and other special conditions.

C. Manufacturer's qualification statement.

D. Installer's qualification statement.

E. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience and providing technical representative to visit project site.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Take necessary precautions to keep cementitious materials dry.

1.08 FIELD CONDITIONS

A. Maintain environmental conditions, such as temperature, humidity, and ventilation within limits recommended by manufacturer for acceptable results; do not install products under environmental conditions outside the manufacturer's indicated limits.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Installer Warranty: Provide 2-year warranty commencing on the Date of Substantial Completion for correcting leaking waterproofing, unless leakage is caused by structural failure, structural movement, or other causes beyond the installer's control. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Crystalline Waterproofing:
1. Euclid Chemical Company; VANDEX SUPER: www.euclidchemical.com/#sle.
2. W. R. Meadows, Inc; CEM-KOTE CW PLUS: www.wrmeadows.com/#sle.
3. Xypex Chemical Corporation; Xypex Concentrate: www.xypex.com/#sle. **BASIS OF DESIGN**.
4. Substitutions: See Section 016000 - Product Requirements.

B. Liquid Waterproofing Admixture:
1. As recommended by crystalline waterproofing manufacturer..

2.02 ASSEMBLIES

A. Crystalline Waterproofing for Concrete Building Surfaces:
1. Interior side of elevator pits.
2. Surfaces as indicated on drawings.

2.03 MATERIALS

A. Crystalline Waterproofing: Portland cement, quartz or silica sand, and other active chemicals that when applied to surface of concrete forms insoluble crystals in capillary pores preventing passage of liquids, while having no adverse effect on normal properties of concrete.
1. Water Permeability of Applied Concrete: No measurable leakage or water flow at pressure ranging from 175 psi (1.21 MPa) to 200 psi (1.38 MPa) when tested in accordance with COE CRD-C 48, using at least 2-inch (51 mm) thick sample, and with applied surface preparation and installation in accordance with NRCA (WM).
2. Toxicity: Non-toxic.
a. Potable Water and Drinking Water Safe: Provide UL (DIR) listed and labeled waterproofing; tested safe for use in potable drinking water applications in accordance with NSF 61.

B. Liquid Waterproofing Admixture: Nontoxic liquid admixture, free of Volatile Organic Compounds (VOCs), manufactured with deionized water, and formulated to react with hydroxide ion products by cement hydration process. Specifically formulated for use in normal and lightweight structural concrete mixes.
1. Mitigating Effects: Alkali-Silica Reaction (ASR) mitigation in accordance with ASTM C1260, and mitigating effect on shrinkage in accordance with ASTM C157/C157M.
2. Toxicity: Nontoxic.

3. VOCs: None.
4. Products:
   a. As recommended by crystalline waterproofing manufacturer.

C. Plugging Compound: Ready-mixed cementitious compound meeting requirements and approved by waterproofing manufacturer, resistant to water but vapor permeable for horizontal, vertical, and overhead surfaces not exposed to vehicular traffic and compatible with substrate.

D. Patching Compound: Ready-mixed cementitious mortar approved by waterproofing manufacturer for patching or filling tie holes, reveals, honeycombs, or other damaged cementitious surfaces and compatible with substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions, and consider use of sandblasting, water blasting, or acid etching as recommended.

C. Plug water leaks.

D. Patch holes, construction joints, and cracks; remove defective concrete.

E. Obtain approval of manufacturer's field representative before beginning installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions, maintain environmental conditions required and recommended by manufacturer, and keep a copy of manufacturer's instructions on site.

B. Coordinate waterproofing installation with installation of products that must penetrate waterproofed surfaces.

C. Prevent excessive drying of surface.
   1. Cure waterproofing for at least three days, or length of time required by manufacturer, with water spray and adequate air circulation.
   2. Do not use chemical curing agents unless explicitly approved by waterproofing manufacturer.

D. Do not backfill, fill water or liquid holding structures, or apply finish coatings until time period recommended by manufacturer has passed.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Flood test waterproofing application by filling water holding structures to capacity and allowing to stand for not less than 24 hours.

C. If any leaks appear, notify Architect and drain.
   1. Repair leaks at no additional cost to Owner.
   2. Repeat flood test until any leakage is eliminated.

3.05 PROTECTION

A. Protect from damage by weather; do not cover with vapor impermeable sheathing or films unless air circulation is provided.

B. Touch-up, repair or replace damaged waterproofing after Date of Substantial Completion.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, over roof deck, and exterior wall behind metal panel wall finish.

B. Batt insulation in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

B. Section 072700 - Air Barriers: Separate air barrier materials.

C. Section 075200 - Modified Bituminous Membrane Roofing: Installation requirements for board insulation over low slope roof deck.

1.04 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.06 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation Over Metal Stud Framed Walls, Continuous: Polyisocyanurate board.

D. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

E. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

F. Insulation over Roof Deck: Polyisocyanurate board.
   1. Refer to Specification Section 075200 - Modified Bituminous Membrane Roofing.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Board Edges: Square.
   7. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
   8. Products:
      a. DuPont de Nemours, Inc; Styrofoam Brand Panel Core 30: building.dupont.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation Foamular 250: www.ocbuildingspec.com/#sle.

B. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides and Water-Resistive Barrier: Complying with ASTM C1289.
   1. Insulation Over Metal Stud Framed Walls, Continuous.

2. Classifications:
   a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
      1) Class 2 - Faced with coated glass fiber mat facers on both major surfaces of the core foam.
      2) Compressive Strength: Classes 1-2-3, Grade 3 - 25 psi (172 kPa), minimum.
      3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F (24 degrees C).
3. Flame Spread Index (FSI): Class B - 26 to 75, when tested in accordance with ASTM E84.
4. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
5. Comply with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
6. Board Size: 48 by 96 inch (1220 by 2440 mm).
7. Board Thickness: 4-1/2 inch (114.3 mm).
8. Board Edges: Square.
9. Water Vapor Permeance: 1.2 perm (68 ng/(Pa s sqm)), maximum, at 1 inch (25 mm) thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
10. Products:
    a. Atlas Roofing Corporation; EnergyShield CGF Pro Wall Insulation: www.atlasroofing.com/#sle.
    b. DuPont de Nemours, Inc; Thermax XARMOR (ci) Exterior Insulation: building.dupont.com/#sle.
    c. Sika USA; Durasheath CI for Exterior Walls: www.rmax.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Products:
      a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
      b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
      c. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.

2.04 ACCESSORIES

A. Flashing Tape: Special reinforced film with high performance adhesive.
   1. Application: Window and door opening flashing tape.
   2. Width: As required for application.
   3. Primer: Tape manufacturer's recommended product.

B. Support for Cladding and Continuous Insulation: See respective cladding section.

C. Wire Mesh: Galvanized steel, hexagonal wire mesh.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches (152 mm) wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install insulation board system per manufacturer's instructions at existing concrete/walls and existing masonry walls to receive material(s).

B. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Apply adhesive to back of boards:
   1. Three continuous beads per board length.

D. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and protrusions.

E. Extend boards over expansion joints, unbonded to wall on one side of joint.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

G. Place 6 inches (152 mm) wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames, and tape seal in place to ensure continuity of vapor retarder and air seal.

H. Tape insulation board joints.

3.04 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.05 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.06 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Board Installation Over Roof Deck, General:
   1. See applicable roofing specification section for specific board installation requirements.
   2. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.
   3. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
   4. Do not apply more insulation than can be covered with roofing on the same day.

3.07 BATT INSTALLATION

A. Install insulation and vapor retarder, as required, in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain insulation batts in place with spindle fasteners at 12 inches (305 mm) on center.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. Coordinate work of this section with construction of air barrier seal, see Section 072700.

3.08 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
   1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

3.09 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072700
AIR BARRIERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Air barriers.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Air barrier under exterior cladding.

B. Section 076200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.

C. Section 092116 - Gypsum Board Assemblies: Air barrier under exterior cladding.

1.04 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.05 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

F. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2025.

G. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

J. Testing agency qualification statement.

1.07 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

B. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

D. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.08 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct air barrier mock-up, 10 feet (3.048 m) long by 10 feet (3.048 m) wide, indicating all manufacturer requirements for a complete, compliant system.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.09 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Material: Acrylic.
      b. Dry Film Thickness (DFT): 30 mil, 0.035 inch (0.89 mm), minimum.
      c. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.

d. Water Vapor Permeance: 20 perms (1144 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F (23 degrees C).
e. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to four months of weather exposure.
f. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
g. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
h. Comply with NFPA 285 requirements for wall assembly.
i. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
k. Products:
    1) GCP Applied Technologies; Perm-A-Barrier VPL 50RS UV Stable: www.gcpat.com/#sle.
    2) Tremco Commercial Sealants & Waterproofing; ExoAir 230: www.tremcosealants.com#/sle.
    3) W. R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
    4) Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
    1. Include all items required for a complete, compliant system.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
    1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
    2. Color: Manufacturer's standard color for compatable system.
    3. Products:
        a. Manufacturer's recommended for the required use.

C. Foil-Faced Self-Adhering Flashing: Membrane consisting of cross-laminated high-density polyethylene facer laminated to ultraviolet (UV) and weather-resistant exterior aluminum foil facer, using nonasphaltic, butyl-based adhesive to self-adhere to substrate.
    1. Thickness: 45 mil, 0.045 inch (1.14 mm), minimum.
    2. Roll Size: 50 feet (15.2 m) long by 4 inches (102 mm) wide.
    3. Tensile Strength: 400 psi (2.76 MPa), minimum, complying with ASTM D412.
    4. Manufacturer's recommended for the required use.

D. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.
    1. Manufacturer's recommended for the required use.

E. Stainless Steel Flashing: Flexible flashing with 2 mil, 0.002 inch (0.051 mm) thick Type 304 stainless steel sheet, 8 mil, 0.008 inch (0.203 mm) of butyl adhesive and siliconized release liner.
    1. Roll Length: 50 feet (15.2 m) long.
    2. Width: 6 inches (152 mm) wide.
    3. Overlap joints at least 2 inches (51 mm).
    4. Manufacturer's recommended for the required use.

F. Liquid Flashing: One part, fast curing, nonsag, gun grade, trowelable.
    1. Manufacturer's recommended for the required use.

G. Seam and Perimeter Tape: Polyethylene face material with acrylic adhesive.
   1. Manufacturer's recommended for the required use.

H. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Fluid-Applied Coatings or Membranes:
   1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
   2. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.
   3. Apply bead or trowel coat of mastic sealant with minimum thickness of 1/4 inch (6 mm) along coating seams, rough cuts, and as recommended by manufacturer.
   4. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

E. Rigid Board Insulation Air Barrier System:
   1. Prepare substrate in accordance with board manufacturer's installation instructions.
   2. Verify that penetrating items are in place.
   3. Use maximum board lengths to minimize number of joints.
   4. Locate end joints over framing. Center end joints over supports and stagger in each course.
   5. Secure insulation directly to framing using manufacturer's recommended screw-fastener with washer.
      a. Fastener spacing in accordance with manufacturer's instructions.
   6. Seal joints and penetrations with manufacturer's joint tape, flashing tape, and liquid flashing; comply with ASTM E2357.

F. Openings and Penetrations in Exterior Air Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.

2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

C. Do not cover installed air barriers until required inspections have been completed.

D. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

E. Take digital photographs of each portion of installation prior to covering up air barriers.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels and subgirt framing assembly, with related flashings and accessory components.

1.03 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation.

B. Section 072500 - Weather Barriers: Weather barrier under wall panels.

C. Section 072700 - Air Barriers: Air barrier under wall panels.

D. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.04 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

B. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, coordination details with adjacent construction, and methods of anchorage.
   1. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
   2. Include the professional engineer's stamp and signature on each sheet of shop drawings and associated design calculations. The professional engineer is to be currently licensed in the State having jurisdiction, responsible for their preparation.

D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.

E. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation for Installation of Building Rainscreen Assembly: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.

I. Maintenance Data: For metal panels to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
   1. All design work and associated calculations are to be stamped and signed by a professional structural engineer currently licensed in the State having jurisdiction, responsible for their preparation.

C. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum five years of documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

E. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

F. All metal panel systems and associated attachments are to be a complete system and be provided by a single source manufacturer.

1.07 MOCK-UPS

A. Construct mock-up, 10 feet (3.048 m) long by 10 feet (3.048 m) wide; include panel and soffit system, glazing, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, and related insulation in mock-up.

B. Locate as directed by Architect.

C. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.09 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
   1. Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   2. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

C. Correct defective work within a ten year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners:
   1. Berridge Manufacturing Company; S-Deck Panel: www.berridge.com/#sle.
   2. Petersen Aluminum Corporation; 7/8 inch Corrugated Panel: www.pac-clad.com/#sle. **BASIS OF DESIGN**.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior wall panels and subgirt framing assembly.
   2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   3. Design Pressure: In accordance with Structural Drawings and applicable codes.
   4. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
   5. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
   6. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   7. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   8. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   9. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
      a. Minimum Length: 10 feet (3 m).
   10. Corners: Factory-fabricated in one continuous piece with minimum 2 inch (51 mm) returns.
   11. Provide continuity of air barrier seal at building enclosure elements in accordance with requirements; see Section 072700.
   12. Exterior Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.
   13. Exterior Panel Back Coating: Panel manufacturer's standard polyester wash coat.

B. Exterior Wall Panels:

1. Profile: Vertical; style as indicated.
2. Side Seams: Lapped as recommended by manufacturer, sealed with continuous bead of sealant.
3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch (0.76 mm) minimum thickness.
4. Panel Width: 36 inches (914 mm).
5. Color: As selected by Architect from manufacturer's full line.

C. Subgirt Framing Assembly:
1. Manufacturer to provide designed system utilizing manufacturer's standard components sized to meet all design loading requirements for system.
2. Minimum Gage: 20 gage, 0.032 inch (0.81 mm) thick formed steel sheet.
3. Manufacturer's standard z-girt profile; to attach panel system to structural frame or building's structural wall system.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; brake formed to required angles.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; 20 gauge, 0.032 inch (0.81 mm) thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim, Closure Pieces, Caps, Flashings, Facias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
1. Typical, for all metal wall panel systems specified in this section.
2. In addition, provide manufacturer recommended internal and external corner flashings for each metal panel system.
3. Length: 10 feet (3.048 m), minimum.

G. Anchors: Stainless steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

C. Insulation: Mineral-fiber type, see Section 072100.
1. Thickness: 4-1/2 inch (51mm).
2. Thermal Resistance: R of 8.4 (RSI of 1.48).

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

C. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

E. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.05 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 079200

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, stainless steel. Fastener cap same color as exterior panel.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

E. Field Touch-up Paint: As recommended by panel manufacturer.

F. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at 16 on center, maximum (at 406 on center, maximum).
   1. Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's engineered requirements.
   2. General Contractor to coordinate metal stud system placement as required by structural design requirements.

3.03 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.
   1. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
      a. Shim or otherwise plumb substrates receiving metal panels.
      b. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
      c. Install screw fasteners in predrilled holes.
      d. Locate and space fastenings in uniform vertical and horizontal alignment.
      e. Install flashing and trim as metal panel work proceeds.

f. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
g. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
h. Provide weathertight escutcheons for pipes and conduits penetrating panels.

2. Fasteners:
   a. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
      1) As recommended by manufacturer for fully concealed system.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends as recommended by manufacturer and industry standards.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.05 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch (1.6 mm), maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch (6.4 mm), maximum.

3.06 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

D. Maintain in a clean condition during construction.

3.07 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 075200
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Modified bituminous roofing membrane, conventional application.

B. Insulation, flat.

C. Cover boards.

D. Roofing cant strips, roofing expansion joints, walkway pads, and miscellaneous accessories required for system installation.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood nailers and curbs.

B. Section 061000 - Rough Carpentry: Wood cant strips.

C. Section 070150.19 - Preparation for Re-Roofing.

D. Section 086200 - Unit Skylights: Skylight frame, integral curb, and counterflashing.

1.04 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

C. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011 (Reapproved 2023).

D. ASTM D6164/D6164M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements; 2021.

E. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).

F. FM (AG) - FM Approval Guide; Current Edition.

G. NRCA (RM) - The NRCA Roofing Manual; 2024.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated flashings and counterflashings installed by other sections.

B. Disposal of construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
   1. Removal of waste is to be done daily at the end of each day's work.

C. Comply with the published recommendations and instructions of the roofing membrane/system manufacturer.

D. Commencement of work by Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No

modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

E. Deviations: In the event these Specifications or the Drawings deviate from the manufacturer's current specifications, these specifications prevail, except where they conflict with the manufacturer's requirements for the specified guarantee. In this case, the manufacturer's specifications prevail.

F. Specification Amendments: Drawings, addenda and modifications may be issued subsequent to the printing of these Specifications. Ascertain that such amendments to these Specifications are workable alterations.

G. Contractor Acceptance: Prior to the pre-roofing conference, ascertain that all aspects of these Specifications and possible modifications are workable and do not conflict with the manufacturer's requirements for the specified guarantee. Upon commencement of the work, it will be presumed that these Specifications and drawings, addenda and modifications are satisfactory to both the Contractor and the manufacturer in their entirety.

H. Supplied Materials: Supply all materials of the roofing system, including accessory and specialty products. The bidding Contractor, by making his bid, represents that his bid price is based on the use of the materials listed in “Part 2 – Products” in this Section, associated Sections in this specification, and project Drawings for a complete roofing system installation.

I. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.

1.06 DEFINITIONS

A. Roofing Terminology:
   1. Refer to the following for definition of terms related to roofing work in this section:
      a. ASTM D1079, "Standard Terminology Relating to Roofing and Waterproofing", latest edition.
      b. NRCA Roofing and Waterproofing Manual, latest edition.
      c. The International Institute of Building Enclosures Consultants "Interface" Technical Journal.

B. Sheet Metal Terminology and Techniques:
   1. SMACNA Architectural Sheet Metal Manual, latest edition.

1.07 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog data for membrane and bitumen materials, base flashing materials, insulation, surfacing, and cover board and associated materials required for system.
   1. Sustainable Design Submittal: Include testing documentation of solar reflectance index.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and all details required for complete system.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

J. Submittal of Equals: A Contractor may submit a primary roof system to be considered as equals to the specified roof system no less than 10 days prior to bid date. List the name of the substituted items, the manufacturer, model/number, etc., and any other deviations in performance or appearance from the “Standards” set forth in this Section. The Contractor shall present to the Owner a written guarantee and certification that the substituted material/method meets the standards of the materials specified. The burden of proof of quality and equality rests on the Contractor. The Owner reserves the right to determine if the material is equal to the specified and is acceptable under this contract. Primary roof systems which have been reviewed and accepted as equals to the specified roof system will be listed in an addendum prior to bid date; only then will equals be accepted at bidding. Submittals shall include the following:
   1. Two 3 inch x 5 inch samples of the primary roofing and flashing sheets.
   2. Latest edition of the roofing system manufacturer’s specifications and installation instructions.
   3. Evidence that the manufacturer of the proposed roofing system utilizes a quality management system that is ISO 9001 certified. Documentation of ISO 9001 certifications of foreign subsidiaries without domestic certification will not be accepted.
   4. Descriptive list of the materials proposed for use.
   5. Evidence of Underwriters’ Laboratories Class A acceptance if the proposed roofing system without additional requirements for gravel or coatings. No other testing agency approvals will be accepted.
   6. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
   7. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.
   8. List of 3 of the proposed primary roofing manufacturer’s projects, located in this region of the United States, acceptable to the Architect, of equal size and degree of difficulty which have been performing successfully for a period of at least 10 years.
   9. Letter from the proposed primary waterproofing manufacturer confirming that the filler content in the elastomeric blend of the proposed roof membrane and flashing components does not exceed 35% by weight.
   10. Request for substitution constitutes a representation that the Contractor:
      a. Has personally investigated the proposed substitute product and/or system and determined that it is equal to or superior in all respects to that specified.
      b. Will provide the same or better warranties, bonds and guarantees for the substitution as for the specified.
      c. Will coordinate the installation of an accepted substitution into the Work and making such changes as may be required to make the Work complete in all respects.
      d. Waives all claims for additional costs, related to the substitution, which subsequently become apparent.
      e. Certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect’s redesigns costs, and waives all claims for additional costs related to the substitution which subsequently become apparent.

11. Should the Contractor propose a substitute material or method assembly that is of questionable quality or suitability to the Architect or Owner, suitable tests may be required to establish a basis for acceptance or rejection. Such tests will be paid for by the Contractor and conducted in accordance with industry accepted standards and as acceptable to the Architect or Owner.
12. Substitutions will not be considered when they are indicated or implied in shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
13. The Architect shall be the judge of the acceptability of proposed substitutions.
14. The Owner reserves the right to disapprove and reject any request for substitution.
15. Sample copy of proposed guarantee.
16. Completed Product Substitution Request Form included with this specification section.

K. Submittals Prior to Project Close-out:
1. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.08 QUALITY ASSURANCE

A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.

B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001:2015 audit process. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.

C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.

D. Underwriters Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.

E. Accessory products shall be supplied by a single roof manufacturer for coverage under the terms of the guarantee. The primary roofing membrane manufacturer shall have private labeling agreements with secondary and accessory product suppliers for the listed products; thermal insulation, cements, primers, sealants, and perimeter metal systems, etc. The manufacturer shall provide evidence that it complies with these requirements:
1. Provide manufacturer’s commercial product data sheets.
2. If the primary roof manufacturer has an expressed endorsement for secondary and accessory roof system products. A letter will be required from the primary roofing system manufacturer detailing any expressed endorsements with secondary and accessory product suppliers and evidence of how the product and/or material is to be covered under the terms of the guarantee.

F. Pre-Roofing Conference: Before the roofing work is scheduled and commence, after shop drawings have been reviewed by the Architect, and before any materials are ordered. A conference shall be called at the job site by the Contractor for the purpose of reviewing the drawings and specifications. The intent is to resolve questions before the work is started. The conference shall be attended by the roofing contractor, and his foreman, General Contractor’s Superintendent, roof manufacturer’s representative as well as the Architect’s and Owner’s representative.

G. The representative of the Architect, Owner, the General Contractor, the Roofing Contractor and Roofing Manufacturer's representative shall make inspections of the roofing system toward the end of the one (1) year warranty period and toward the end of the roofing system roofing Contractors' two (2) year guarantee period. The Roofing Contractor or Roofing System Manufacturer, as applicable, shall make approved repairs and/or replacements covered by the Guarantee. The project will not be accepted until the Roofing Contractor's Guarantee, executed in strict accordance with the Contract Documents, have been submitted and accepted by the Architect and Owner. (A sample of the total roof system guarantee shall be submitted in shop drawings.)

H. The roofing system supplier shall furnish the Roofing Contractor with Material Safety Data Sheet/Sheets (MSDS), incorporating OHSA approved form, current edition. Said sheets shall be available at the site at all times until project completion.

I. The Roofing Contractor shall submit to the Architect, in a ring binder, three copies of all roofing data used in the Project for distribution to the Owner.

J. Roofing Contractor two (2) year guarantee: Submit two (2) executed copies of the attached guarantee two (2) year "roofing guarantee" covering work of this section including roofing membrane, composition flashing, roof insulation systems, vapor barriers, and roofing accessories, signed and countersigned by installer (roofer) and Contractor. The roof systems guarantee shall be against leaks from faulty or defective materials and workmanship for an applicable period of two (2) years starting on the date of substantial completion.

K. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.
   1. Contractor to provide daily field reports documenting work progress. Field reports to contain descriptive written account of work being performed including representive photographs on a daily basis.

L. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

M. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

N. Submittals Prior to Contract Award:
   1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
   2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.

O. Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roof system manufacturer's twenty (20) year labor and materials roof system guarantee. The roof system guarantee shall include both the roofing and flashing membrane, the insulation system, and all associated metal flashings, trim, roofing

specialties and accessories. All repairs or replacement costs covered under the guarantee shall be borne by the roofing membrane manufacturer. The guarantee shall be a term type, without deductions or limitations on coverage amount, and be issued at no additional cost to the Owner.

P. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

Q. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, and approved by manufacturer.
   1. Acceptable Contractor: To be certified in writing by the roofing materials manufacturer to install the primary roofing products

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact unless otherwise indicated.

B. Store materials in weather protected environment, clear of ground and moisture; ballast materials may be stored outdoors.
   1. Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

C. Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

E. Protect foam insulation from direct exposure to sunlight.

F. Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.10 FIELD CONDITIONS

A. Requirements Prior to Job Start:
   1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
   2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
   3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Do not apply roofing membrane when environmental conditions are outside the ranges recommended by manufacturer.

C. Do not apply roofing membrane during unsuitable weather.
   1. Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

D. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C).

E. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

F. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

G. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

H. Protection Requirements:
   1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
   2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.
   3. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
   4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
   5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.11 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a 2-year period after Date of Substantial Completion.

C. Provide 20-year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
   1. Roof Membrane/System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's 20-year No Dollar Limit labor and materials guarantee covering the rigid insulation, insulation installation, base sheet installation/fasteners, roof membrane/flashing systems and the perimeter sheet metal systems, as specified in all associated specification sections for a complete roof system. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner.
      a. Manufacturer's 20 year Unlimited Roof Membrane/System Guarantee.
      b. Stipulations inconsistent with the warranty requirements, or change of venue, will not be accepted.
      c. Owner will not co-sign the warranty.
      d. Contractor shall provide 2 year weathertight warranty for all materials/installations.
      e. Complete system warranty for all roof penetrations shall be provided.
      f. The guarantee shall cover against manufacturing defects in all roofing system components.

PART 2 PRODUCTS

2.01 ROOFING - CONVENTIONAL APPLICATION

A. Modified Bituminous Roofing: Two-ply membrane, with insulation. System set in manufacturer's recommended cold applied adhesive.

B. Roofing Assembly Requirements:
   1. Solar Reflectance Index (SRI): 75, minimum, calculated in accordance with ASTM E1980, based on 3-year aged data.
      a. Field applied coating may not be used to achieve specified SRI.
   2. Insulation Thermal Resistance (R-Value): 5.7 per inch, minimum; provide insulation thickness that matches the insulation thickness removed.
   3. Surfacing: Mineral granules.

C. Acceptable Insulation Types - Constant Thickness Application:
   1. Single-layer or multiple-layers as required to match thickness indicated on the Drawings of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application: thickness as required by the Drawings .
   1. Tapered polyisocyanurate board.

2.02 MEMBRANE AND SHEET MATERIALS - OVER EXISTING LIGHTWEIGHCONCRETE DECK

A. Membrane: One-ply polymer modified asphalt, reinforced with nonwoven fabric; granule surfaced; with the following characteristics:
   1. Minimum Quality: ASTM D6164/D6164M Type I; styrene-butadiene-styrene (SBS) modified, polyester reinforced.
   2. Thickness: 157 mils (0.157 inch) (4.0 mm).
   3. Average Weight: 1.096 pounds per square foot (5.351 kg/sq m).
   4. Sheet Width: 39.4 inch (1000.76 mm).
   5. **Basis of Design:** Soprema, Inc.; Sopralene 180 FR GR (SG), Product #05006(SG): www.soprema.us/#sle.
   6. Alternate Manufacturer:
      a. GAF; Ruberoid Mop Plus Granule FR Membrane: www.gaf.com/#sle
      b. Johns Manville; DynaLastic 180 FR CR G: www.jm.com/#sle.

B. Inner-ply: One-ply polymer modified asphalt, reinforced with nonwoven fabric; smooth surfaced; with the following characteristics:
   1. Minimum Quality: ASTM D6164/D6164M Type I; styrene-butadiene-styrene (SBS) modified, polyester reinforced.
   2. Thickness: 120 mils (0.118 inch) (3.0 mm).
   3. Average Weight: 0.75 pounds per square foot (3.662 kg/sq m).
   4. Sheet Width: 39.4 inch (1000.76 mm).
   5. **Basis of Design:** Soprema, Inc.; Sopralene 180 Sanded, Product #00220: www.soprema.us/#sle.
   6. Alternate Manufacturer:
      a. GAF; Ruberoid Mop Plus Smooth Membrane: www.gaf.com/#sle
      b. Johns Manville; DynaFast 180 HW: www.jm.com/#sle.

C. Flexible Flashing Material: Same material as membrane.
   1. Material to be used between roofing plies at roofing extents and penetrations per manufacturer.
      a. One-ply SBS inner-ply sheet under one-ply SBS fire retardant, granular cap sheet as recommended by manufacturer.

2.03 BITUMINOUS MATERIALS

A. Insulation Adhesive: Roofing Manufacturer's recommended two-part (Part A and Part B; mixed) polyurethane foam insulation adhesive system to adhere roofing insulation and cover-boards as directed to meet current ASCE-7 roof zone requirements for wind up-lift.

B. Asphalt Primer: ASTM D41/D41M, asphalt type.

C. Mastic Sealant: Manufacturer's recommended Polyisobutylene; non-hardening, non-skinning, non-drying and non-migrating sealant.

2.04 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/2 inch (12.7 mm), fire-resistant.
   2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
   3. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E84.
   4. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   5. Products:
      a. Georgia-Pacific; DensDeck Prime Roof Boards with EONIC Technology: www.densdeck.com/#sle.
      b. Gold Bond Building Products; DEXcell FA Glass Mat Roof Board: www.goldbondbuilding.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

2.05 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam complying with ASTM C1289.
   1. Board insulation as recommended by roofing system manufacturer.
      a. 1/4-inch slope for drainage to be maintained.
      b. Sumps to slope 1/2-inch at roof drains.
      c. Roof Crickets to slope 1/2-inch.
   2. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
         3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inches (38 mm) thick; Class 1, Grades 1-2-3, 8.4 (1.48) at 75 degrees F (24 degrees C).
         4) UL-Classified and FM-approved for direct to steel and concrete deck applications.
   3. Board Size: 48 by 96 inches (1,220 by 2,440 mm).
   4. Board Thickness: 1.5 inches (37.5 mm).
   5. Board Edges: Square.
   6. Products:
      a. Atlas Roofing Corporation; ACFoam Supreme Foil Faced Roof Insulation: www.atlasroofing.com/#sle.
      b. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
      c. Johns Manville; ENRGY 3 - Flat and Tapered: www.jm.com/#sle.

2.06 SURFACING MATERIALS - CONVENTIONAL APPLICATION

A. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Size: 30 by 60 inches (762 by 1524 mm).
      a. Cut from roll.
   2. Thickness: 0.197 inches (5.0 mm).
   3. Products:
      a. **Basis of Design**: Soprema, Inc; Soprawalk: www.soprema.us/#sle.
      b. Alternate:
         1) Johns Manville; DynaTread Roof Walkway: www.jm.com/#sle.

2.07 METAL SPECIALTIES AND ACCESSORIES

A. General: All systems are to be designed and engineered by roofing manufacturer to meet or exceed the project design requirements as specified.

B. Metal Roof Edging and Fascia: Roofing manufacturer's continuous metal edge member with concealed splice plates serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
   1. Wind Performance to meet or exceed requirements on Structural Drawings:
      a. Membrane Pull-Off Resistance: 100 lbs/ft (1460 N/m), minimum, when tested in accordance with ANSI/SPRI/FM 4435/ES-1 Test Method RE-1, current edition.
      b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 Test Method RE-2, current edition.
   2. Fascia Material and Finish: .032 inch (0.8 mm) thick formed aluminum, fluoropolymer (PVDF) finish, color to match or as selected by Architect from manufacturer's full range; matching concealed joint splice plates; factory-installed protective plastic film.
   3. Length: 144 inches (3650 mm), maximum.
   4. Functional Characteristics: Fascia retainer and cleat support fascia while allowing for free thermal cycling.
   5. Anchor Bar Cleat: 18 gage, .040 inch (1.0 mm) G90 coated commercial type galvanized with pre-punched holes.
   6. Fasteners: Manufacturer recommended, factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
   7. Special Shaped Components: Provide manufacturer recommended, factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 18 inch (457 mm) long legs on corner pieces.
   8. Scuppers: Welded, watertight.
   9. Accessories: Provide matching wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

2.08 ACCESSORIES

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.
   3. Lumber for Nailers and Blocking: Nominal sizes are indicated except as shown by detail dimensions. Provide actual sizes as required by PS 20 for maximum 19% moisture content.

a. Grade and Species: No. 2 grade light framing size lumber, any west coast or southern pine species; southern pine board size lumber.
b. Preservative Treatment: Comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC/s Board of Review.
c. Pressure-treat all lumber with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft (6.4 kg/cu. m).
d. Nailers used for edge metal securement shall be a minimum six (6) inches wide with a thickness to match the height of the new insulation assembly.

B. Cant Strips: Wood; pressure preservative treated.
1. Cants formed to 45 degree angle.

C. Lead Pipe Flashings: 4 pound lead pipe flashing caps shall be preformed to extend 2 inch (51 mm) (exterior exposure), minimum, beyond top of pipe and allow for a minimum of one (1) inch to be crimped inside of the pipe stack.

D. Fabricated Metal Enclosures:
1. All formed metal enclosures shall be as indicated on the drawings. Minimum height to be 8 inch (203 mm) above roof membrane. All joints are to be lapped and seams soldered.
2. Metal pipe flashings shall consist of a two (2) component assembly:
a. The first component shall be a metal roof jack having a minimum four (4) inch perimeter flange, and a sleeve opening to fit closely around the penetration without forcing, with a minimum 8 inch (203 mm) height above roof membrane. All metal laps shall be fastened and soldered.
b. The second component shall be a metal, watertight umbrella, fabricated to be mechanically secured tightly around the roof penetration and extend beyond the roof jack opening by a minimum radius of three (3) inches. The top edge of the watertight umbrella shall be sealed using a manufacturer recommended sealant.

E. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (152 mm) wide; self adhering.

F. Base Sheet Fasteners: Appropriate for purpose intended and approved by roofing manufacturer to meet current ASCE-7 wind speed and uplift requirements.
1. Length as recommended by roofing manufacturer, with metal washers for installation at existing lightweight concrete insulation over existing roof deck.

G. Roofing Nails: Galvanized, hot-dipped type, size and configuration as required to suit application.

H. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.

I. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 GENERAL

A. Meetings: Conduct a pre-job conference including the Architect, Authorized Representative, Roofing Contractor and Manufacturer's Representative prior to application of roofing.

B. Foreman: The roofing foreman shall have a copy of these specifications on the job site at all times. The presence of specifications and an inspector shall not relieve the Contractor of strict compliance with the manufacturer's specifications, detail drawings, and/or approved material requirements.

C. Deck Penetrations: Contractor shall verify that work penetrating the roof deck, or which may otherwise affect the roofing application, has been properly completed.

D. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

E. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

F. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

G. Perform work using competent and properly equipped personnel.

H. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

I. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

J. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

K. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

L. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

F. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
   1. Roof Decks - General: Structural roof decks shall properly provide sufficient strength to support anticipated dead and live loads and normal construction traffic without excessive deflection or movement. All openings, walls or projections through the roof deck shall be

completed before application of the roof membrane is begun. The deck shall be constructed, and necessary deck repairs made according to the deck manufacturer's specifications following best established practices.

2. Examine roof substrate to verify that it is properly sloped to drains.
3. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptance of project conditions and requirements.
4. Verify that wood nailers have been properly installed.

3.03 PREPARATION - GENERAL

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
   1. All surfaces shall be swept or vacuumed, removing all loose aggregate and foreign substances prior to commencement of roofing.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable to insulation and membrane manufacturers.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

E. Wood Nailers: Provide wood nailers at all perimeters and other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.
   1. Install with 1/8 inch gap between each length and at each change of direction.
   2. Mechanically fasten to deck to resist force of 200 lbf per linear foot (35 kN/m).

F. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.04 INSTALLATION - INSULATION

A. Insulation - General: Insulation panels shall be installed with ends offset; edges of the panels shall be in moderate contact, and without forcing, applied in strict accordance with the insulation manufacturer's requirements.

B. Attachment of Insulation: Adhere each layer of insulation, using roofing manufacturer's recommended adhesive system, to mechanically fastened base sheet in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
   1. **This shall be verified by manufacturer.**

C. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
   1. Install cover board, staggering joints from joints of previous insulation layer a minimum of 6 inches in each direction.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
   1. Install where joints are staggered from joints of previous layer a minimum of 6" in each direction.

E. Lay roof insulation in courses parallel to roof edges.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

1. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. Do not apply more insulation than can be covered with membrane in same day.
1. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

3.05 INSTALLATION - MEMBRANE

A. Install modified bituminous membrane roofing system in accordance with manufacturer's recommendations and NRCA (RM) applicable requirements.

B. Install membrane; lap and seal edges and ends permanently waterproof.

C. Install smooth, free from air pockets, wrinkles, fish-mouths, or tears. Ensure full bond of membrane to substrate. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
1. Apply all layers of roofing perpendicular to the slope of the deck.
2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
3. Fully bond the finish ply to the inner-ply/base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.

D. At end of day's operation, or when precipitation is imminent, install waterproof cut-off at all open edges. Remove cut-offs completely before resuming roofing.

E. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 6 inches (152 mm) onto vertical surfaces.
2. Apply flexible flashing over membrane.
3. Secure flashing to nailing strips at 4 inches (102 mm) on center.
4. Insert base flashing into reglets and secure.

F. Edge Metal: Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down 2 inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every 3 inches on center. Strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the gravel-stop rise of the edge metal. See Item: Sealant, for finish of this detail.

G. Around roof penetrations, seal flanges and flashings with flexible flashing.

H. Lead Pipe Flashing Caps: Contractor to provide lead cap over all through-roof pipe conditions as indicated on Drawings. Roof penetrations to be flashed at roof with manufacturer's resin flashing system (See Item - Metal Pipe Flashings).

I. Small Pipe Supports: Support all gas lines and conduits which are a maximum of 1 inch diameter and run horizontally over the roof membrane surface using OMG Pipeguard supports and the manufacturer's walktread - roof protection material. Cut each walktread pad to a size which extends a minimum of 2 inches beyond the perimeter of the blocking. Loosely secure the pipe to allow movement over the 6 inch center of each block; the spacing for the blocks shall be of adequate distance to prevent sagging of the pipe and to prevent the pipe from coming into contact with the new roof assembly. Set the walktread dry over the new roof assembly. Set each pipe support block dry over the walktread pad.

J. Metal Pipe Flashings: Completely prime the metal pipe flanges and allow to dry prior to installation. After the base ply has been applied, set the flanges in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. Install a watertight umbrella to the penetration, completely covering the opening of the pipe flashing. See Item: Sealant for finish of this detail.

K. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

L. Coordinate installation of roof drains and related flashings.
   1. Drain Installation:
      a. Insert the drain stem, with seal attached, into the existing drain plumbing leader until the flange lies flush over the roofing plies.
      b. Tighten the compression seal screws gradually in a crisscross pattern using the tool supplied by the drain manufacturer, ensuring that the compression seal is evenly expanded. The insert drain body is correctly installed when pressure placed on the body results in no vertical movement. Tighten only until hand tight – care must be taken not to over-tighten the compression seal screws.
      c. Secure the drain flange to the roof deck/substrate using a minimum of four (4) “pan-head” fasteners, evenly spaced around the flange.
      d. Flash the drain in accordance with the membrane manufacturer’s requirements.
      e. Place the clamping ring over the metal studs and tighten the stainless steel nuts/lock washers gradually in a crisscross pattern until the clamping ring is secure against the flashing system above the flange. Secure the strainer dome to the clamping ring.

M. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.06 APPLICATION - SURFACE COVER, CONVENTIONAL

A. Apply roof coatings in accordance with roofing and coating manufacturers' instructions.

B. Install walkway pads by setting in roofing manufacturer's recommended sealant or other recommended/approved method. Set joints 6 inches (152 mm) apart.
   1. Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion.

3.07 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.

C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

D. Flood test the entire roof after roof system installation.

E. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.

F. Final Inspection:
   1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

G. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

3.08 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.09 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Roof hatches.

1.03 RELATED REQUIREMENTS

A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.04 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; Current Edition.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer: A minimum of 5 years experience manufacturing similar products.

B. Installer: A minimum of 5 years experience installing similar products.

C. Manufacturer’s Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

D. All products and associated accessories are to be provided by a single-source manufacturer or approved by the manufacturer for use in the specified system(s).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Manufacturers:
   1. Greenheck; ; GPR: www.greenheck.com/#sle.
   2. The Pate Company; PC-4-il/Heavy-Duty AHU Curb: www.patecurbs.com/#sle. **BASIS OF DESIGN**.
   3. Vent Products Company, Inc.; Model 8120 Roof Curbs : www.ventproducts.com/#sle.

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
   2. Roof Curb Mounting Substrate: Curb substrate consists of concrete or concrete over metal deck.
   3. Sheet Metal Material:
      a. Aluminum: 0.080 inch (2.03 mm) minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.
   4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches (102 mm).

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch (38 mm) thick fiberglass insulation.
   3. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.

D. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, fabricated to fit item supported.
   2. Height Above Finished Roof Surface: 8 inches (203 mm), minimum.

2.02 ROOF HATCHES AND VENTS

A. Roof Hatch Manufacturers:
   1. Babcock-Davis; Personnel: www.babcockdavis.com/#sle.
   2. Bilco Company; Type TB (various types and special size): www.bilco.com/#sle. **BASIS OF DESIGN**.
   3. Nystrom, Inc; ThermalMAX: www.nystrom.com/#sle.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.

1. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch (2.3 mm) thick.
   2. Insulation: Manufacturer's standard; 3 inch (76 mm) rigid polyisocyanurate, located on outside face of curb.

D. Metal Covers: Flush, insulated, hollow metal construction.
   1. Capable of supporting 40 psf (1.92 kPa) live load.
   2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch (2.3 mm) thick, liner 0.04 inch (1.0 mm) thick.
   3. Insulation: Manufacturer's standard 3 inch (76 mm) rigid polyisocyanurate.
   4. Gasket: EPDM, continuous around cover perimeter.

E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf (475 kPa) load.
   2. Hinges: Heavy duty pintle type.
   3. Hold open arm with vinyl-coated handle for manual release.
   4. Latch: Upon closing, engage latch automatically and reset manual release.
   5. Manual Release: Pull handle on interior.
   6. Locking: Padlock hasp on interior.

F. Ladder Safety Post: Telescoping post mounted to top rungs of fixed ladder providing a positive hand-hold while enabling user to enter or exit roof hatch in an upright, balanced position.
   1. Material: Aluminum, mill finish.
   2. Products:
      a. Bilco; LadderUP Safety Post: www.bilco.com/#sle.
      b. Babcock-Davis; Ladder Safety Post: www.babcockdavis.com/#sle.
      c. Nystrom; Ladder Safety Post: www.nystrom.com/#sle.

2.03 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
   1. Railing Size: Sized to fit roof access hatch.
   2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with safety factor of two.
   3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
   4. Posts and Rails: Aluminum tubing.
   5. Gate: Same material as railing; automatic closing with latch.
   6. Finish: Manufacturer's standard, factory-applied.
   7. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
   8. Mounting Brackets: Hot-dip galvanized steel, 1/4 inch (6.4 mm) thick, minimum.
   9. Fasteners: Stainless steel, Type 316.
   10. Products:
      a. Babcock-Davis; Safety Railings: www.babcockdavis.com/#sle.
      b. BILCO Company; Bil-Guard 2.0: www.bilco.com/#sle. **BASIS OF DESIGN**.
      c. Nystrom, Inc; Safety Railings: www.nystrom.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

SECTION 078100
APPLIED FIRE PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Applied fire protection of interior structural steel not exposed to damage or moisture.

1.03 RELATED REQUIREMENTS

A. Section 051200 - Structural Steel Framing.

B. Section 052100 - Steel Joist Framing.

C. Section 053100 - Steel Decking.

D. Section 078400 - Firestopping.

E. Section 092116 - Gypsum Board Assemblies: Gypsum board fireproofing.

1.04 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).

D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

F. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members; 2023.

G. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2023).

H. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Field Quality Control Submittals: Submit field test report.

G. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience

1.08 MOCK-UP

A. Construct mock-up, 100 square feet (9.3 sq m) in size.

B. Comply with project requirements for fire ratings.

C. Locate where directed.

D. Examine installation within one hour of application to determine variances from specified requirements due to shrinkage, temperature, and humidity.

E. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary; remove materials and re-construct mock-up.

F. Mock-up may remain as part of the Work.

1.09 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F (4 degrees C) or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fire Protection:
   1. Carboline; ; Pyrocrete 241 : www.carboline.com/#sle.
   2. GCP Applied Technologies; Monokote MK-6: www.gcpat.com/#sle.
   3. Isolatek International Corp; Cafco 300/Isolatek Type 300: www.isolatek.com/#sle.

2.02 APPLIED FIRE PROTECTION ASSEMBLIES

A. UL listings with a Load Restriction are not allowed.

B. Provide fire resistance ratings for following building elements as required by local building code:
   1. Primary structural frame, including columns, girders, and trusses, 1 hour.
      a. U.L. Design No.: U.L. X790.
   2. Floor construction, including supporting beams and joists, 1 hour.
      a. U.L. Design No.: U.L. N759.
   3. Roof construction, including supporting beams and joists, 1 hour.
      a. U.L. Design No.: U.L. P719.

2.03 MATERIALS

A. Applied Fire Protection Material for Interior Applications, Exposed to View and Not to Damage: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
   1. Composition: Gypsum-based; not mineral-fiber-based.
   2. Bond Strength: 150 pounds per square foot (7.2 kPa), minimum, when tested in accordance with ASTM E736/E736M when set and dry.
   3. Dry Density: Minimum average density of 15 lb/cu ft (240 kg/cu m), with minimum individual density of any test sample of 14 lb/cu ft (224 kg/cu m), when tested in accordance with ASTM E605/E605M.
   4. Compressive Strength: 8.33 pounds per square inch (57.4 kPa), minimum.
   5. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
   6. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
   7. Air Erosion Resistance: Weight loss of 0.025 g/sq ft (0.27 g/sq m), maximum, when tested in accordance with ASTM E859/E859M after 24 hours.
   8. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
   9. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fire protection manufacturer.

B. Overcoat: As recommended by manufacturer of applied fire protection material.

C. Metal Lath: Expanded metal lath; minimum weight of 1.7 psf (8 kg/sq m), galvanized finish.

D. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer adhesive in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

E. Apply overcoat at the rate recommended by fireproofing manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
   1. Submit field test reports promptly to Contractor and Architect.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.03 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 017000 - Execution and Closeout Requirements: Cutting and patching.

C. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.04 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023b.

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

I. ITS (DIR) - Directory of Listed Products; Current Edition.

J. FM 4991 - Approval Standard of Firestop Contractors; 2013.

K. FM (AG) - FM Approval Guide; Current Edition.

L. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

M. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

N. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

O. UL (DIR) - Online Certifications Directory; Current Edition.

P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.06 DEFINITIONS

A. Firestop systems: Complete, tested assemblies including wall/floor construction, penetrating items, and field-applied materials designed to prevent the spread of fire through openings.

B. Firestop devices: Factory-built products designed to resist the spread of fire through floor and wall openings, and require only assembly and installation at the project site.

C. Firestopping: Field-applied component materials of firestop systems, which form the seal against spreading fire.

D. Smoke seal systems: Systems designed to stop the spread of smoke through smoke walls. To be a smoke seal system, the system must have at least a one-hour fire-rating.

1.07 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestop systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. F-Rated Systems: Provide firestop systems with F ratings indicated, as determined per ASTM E 814 and UL 1479, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Systems: Provide firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814 and UL 1479, where any of the following conditions exist:
   1. Penetrations that incorporate penetrating items that is in contact with combustible materials in acceptable areas.
   2. Penetrations that are located outside of wall cavities and fire-resistive shaft enclosures.
   3. Penetrations that are located in construction containing doors required to have a temperature rise rating.
   4. Penetrations that incorporate penetrating items larger than a 4 inch diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Special Conditions: For firestopping exposed to traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant firestop systems.
   2. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.
   3. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.08 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
   4. Provide systems tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly.
   5. Provide firestopping products that bear the classification marking of qualified testing and inspecting agency.

B. Single Source Responsibility: Obtain firestopping for each type of penetration and construction condition from a single manufacturer.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.
   2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
   3. Verification of minimum three years documented experience installing work of this type.
   4. Verification of at least five satisfactorily completed projects of comparable size and type.
   5. Licensed by local authorities having jurisdiction (AHJ).

E. Selection: Contractor shall select firestop systems, based on information in the Contract Drawings and on conditions that are expected to exist during installation, from the acceptable types specified in this Section, to satisfy all of the following criteria:
   1. Systems shall meet or exceed the required fire-resistance-rating of the construction involved at each penetration.
   2. Systems shall be rated for installation in the type of construction involved at each penetration.
   3. Systems shall be rated for use in conjunction with penetrating items of the type, size, and number involved at each penetration.

F. Asbestos: Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

G. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

H. Pre-Installation Conference: Before start of firestopping work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
   1. Require attendance with all parties directly influencing the quality of the work or affected by the performance of the work.
   2. Notify Architect well in advance of meeting.

I. Engineering Judgments: For those firestop applications that exist for which no approved tested system is available through a manufacturer, an engineering judgment derived from similar system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow

requirements set forth by the International Firestop Council (September 7, 1994, as may be amended from time to time) and be provided via approved manufacturer.

1.09 MOCK-UPS

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install at least 1 linear foot (0.305 linear m) of firestopping.

B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.

C. If accepted, mock-up will represent minimum standard for this work.

D. If accepted, mock-up may remain as part of this work. Remove and replace mock-ups not accepted.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

B. Storage and Handling: Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.11 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.
   1. Ventilate application areas per firestopping manufacturer's instructions by natural means or, where this is inadequate, forced air circulation.

C. Sequencing and Scheduling: Commence firestopping in each location after penetrating items are complete and tested but prior to concealing the openings.

D. 1. Firestopping shall precede gypsum board finishing.

E. Agency Inspections: Do not conceal firestopping installations behind other construction until authorities having jurisdiction, if required, have examined each installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. Hilti, Inc: www.hilti.com/#sle.
   3. Specified Technologies Inc: www.stifirestop.com/#sle.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Fire Ratings: Refer to drawings for required systems and ratings.

F. Compatibility: Provide components that are compatible with each other, the substrates forming openings, and the penetrating items, if any, under conditions of service and application, as demonstrated by firestopping manufacturer's testing and field experience.

G. Accessories: Provide accessory components for each firestopping system specified by the firestopping manufacturer and approved for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
   1. Permanent forming/damming/backing materials including the following:
      a. Semi-refractory fiber (mineral wool) insulation.
      b. Ceramic fiber.
      c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
      d. Fire-rated form board.
      e. Joint fillers for joint sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Metal collars and sleeves.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

E. Acoustically Rated Firestopping: Provide system tested in accordance with ASTM E90 with STC rating of 50, minimum.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

2.05 MIXING

A. General: For those products requiring mixing prior to application, comply with firestopping manufacturer's directions to produce firestopping products of uniform quality for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.
   1. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected, and penetrating items are complete and tested.

B. Environmental Conditions: Verify that environmental conditions are safe and suitable for installation of firestop products.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install damming materials to prevent liquid material from leakage.

3.03 CONDITIONS REQUIRING FIRESTOPPING

A. General: Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safeing, or otherwise.

B. Through-Penetrations: Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.

C. Membrane-Penetrations: Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet the requirements of third party time/temperature testing.

D. Construction Joints/Gaps: Firestopping shall be provided at the following locations:
   1. Between the edges of floor slabs and exterior walls
   2. In the control joint in masonry walls and floors
   3. In expansion joints

E. Smoke-Stopping: Smoke-Stops shall be provided for Through-Penetrations, Membrane-Penetrations, and Construction Gaps with a material approved and tested for such application as required by other Sections as listed in "Related Sections" of this specification.

3.04 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

1. General: Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
    a. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
    b. Coordinate with plumbing, mechanical, electrical and other trades, to assure that all pipe, conduit, cable, and other items, which penetrate fire-rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction, which would conceal penetrations are not erected prior to the installation of firestops.
    c. Unless specified and approved, all insulation used in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
    d. Seal holes and penetrations to ensure an effective smoke seal.
    e. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
    f. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.
    g. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be fire-stopped using products and systems tested in a configuration representative of the field condition.
2. Dam Construction: When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.
3. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency.

C. Install labeling required by code.

3.05 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.
    1. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

C. Maintain onsite copy of submittal package including system drawings.

D. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.

E. Follow safety procedures recommended in the Material Safety Data Sheets.

F. Finish surfaces of firestopping, which are to remain exposed in the completed work to a uniform and level condition.

G. Accessibility: All areas of work must be accessible until inspection by the applicable Code Authorities.

3.06 CLEANING

A. Clean adjacent surfaces of firestopping materials.
    1. Protect firestopping during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so

that firestop systems are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestop systems complying with specified requirements.

3.07 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.03 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

B. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.04 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

H. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

I. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

J. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

K. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

L. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

M. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

N. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.

O. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Sample product warranty.
   7. Certification by manufacturer indicating that product complies with specification requirements.
      a. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
   1. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

G. Installation Plan: Submit at least four weeks prior to start of installation.

H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

I. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

J. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

K. Installation Log: Submit filled-out log for each length or instance of sealant installed.

L. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

M. Manufacturer's qualification statement.

N. Installer's qualification statement.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.

D. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

E. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
   1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
   2. Mock-ups may become part of the completed Work if protected by Contractor during construction and if accepted by Architect.

F. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

G. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
   4. Allow sufficient time for testing to avoid delaying the work.
      a. Submit at least four weeks prior to start of installation.
   5. Deliver sufficient samples to manufacturer for testing.
   6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

H. Installation Plan: Include schedule of sealed joints, including the following:
   1. Joint width indicated in Contract Documents.
   2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
   3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgment that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
   4. Approximate date of installation, for evaluation of thermal movement influence.
   5. Installation Log Form: Include the following data fields, with known information filled out.
      a. Unique identification of each length or instance of sealant installed.
      b. Location on project.
      c. Substrates.
      d. Sealant used.
      e. Stated movement capability of sealant.
      f. Primer to be used, or indicate no primer is used.
      g. Size and actual backing material used.
      h. Date of installation.
      i. Name of installer.
      j. Actual joint width; provide space to indicate maximum and minimum width.
      k. Actual joint depth to face of backing material at centerline of joint.
      l. Air temperature.

I. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Name(s) of sealant manufacturer's field representatives who will be observing.
   3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.

b. Test date.
c. Location on project.
d. Sealant used.
e. Stated movement capability of sealant.
f. Test method used.
g. Date of installation of field sample to be tested.
h. Date of test.
i. Copy of test method documents.
j. Age of sealant upon date of testing.
k. Test results, modeled after the sample form in the test method document.
l. Indicate use of photographic record of test.

J. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
2. Field testing agency's qualifications.
3. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

K. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

L. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches (457 mm) long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25.4 mm) by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

M. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.08 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

B. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      1) Joints between different exposed materials.
      1) Joints between doors, windows, and other frames or adjacent construction.
      1) Wall expansion and control joints.
      b. Seal the following joints:
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board and plaster finished stud walls and suspended ceilings.
         2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
      c. Other joints indicated below.
   3. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.

d. Joints where sealant installation is specified in other sections.
e. Joints between suspended ceilings and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
4. Wiring Slots in Concrete Paving: Self-leveling epoxy sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
6. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
7. Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.

D. Interior Wet Areas: restrooms; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661 or ASTM D2240.
5. Color: Match adjacent finished surfaces.
6. Cure Type: Single-component, neutral moisture curing.
7. Service Temperature Range: Minus 40 to 300 degrees F (Minus 40 to 149 degrees C).
8. Products:
a. Dow; DOWSIL 795 Silicone Building Sealant: www.dow.com/#sle.
b. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.
c. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com/#sle.
d. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

B. Silicone Sealant: ASTM C920, Grade NS, Use T; single-component, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
2. Color: To be selected by Architect from manufacturer's full range.
3. Products:
a. Dow; DOWSIL 888 Silicone Joint Sealant: www.dow.com/#sle.
b. Pecora Corporation; Pecora 301 NS (Non-Sag): www.pecora.com/#sle.
c. Tremco Commercial Sealants & Waterproofing; Spectrem 800: www.tremcosealants.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: As selected by Architect from manufacturer's full range.
2. Products:
a. Adfast USA Inc; ADSEAL KB 4800 Series: www.adfastcorp.com/#sle.
b. Everkem Diversified Products, Inc; TruSil 100: www.everkemproducts.com/#sle.
c. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

D. Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 15 to 25, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Service Temperature Range: Minus 40 to 185 degrees F (minus 40 to 85 degrees C).
5. Products:
a. Master Builders Solutions; MasterSeal NP100: www.master-builders-solutions.com/en-us/#sle.
b. Sherwin-Williams Company; Stampede 1H Hybrid Sealant: www.sherwin-williams.com/#sle.
c. Tremco Commercial Sealants and Waterproofing; Dymonic FC: www.tremcosealants.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

E. Tamper-Resistant, Silyl-Terminated Polyether (STPE) and Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum
2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Service Temperature Range: Minus 40 to 170 degrees F (minus 40 to 77 degrees C).
5. Products:
a. Pecora Corporation; DynaTrol I-XL Hybrid: www.pecora.com/#sle.
b. Sika Corporation; SikaHyflex-150 LM: www.usa.sika.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

F. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's full range.
3. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
4. Products:
   a. Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
   b. Sika Corporation; Sikaflex-2c NS: www.usa.sika.com/#sle.

G. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Products:
   a. Mapei; Mapeiflex P2 NS: www.mapei.com/#sle.
   b. Pecora Corporation; DynaTread: www.usa-sika.com/#sle.
   c. Substitutions: See Section 016000 - Product Requirements.

H. Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Products:
   a. Pecora Corporation; DynaFlex SC: www.pecora.com/#sle.
   b. Sika Corporation; Sikaflex-2c NS TG: www.usa-sika.com/#sle.

I. Epoxy Sealant: ASTM C881/C881M, Type I and III, Grade 3, Class B and C; two-component.
1. Hardness Range: 65 to 75, Shore D, when tested in accordance with ASTM C661.
2. Compressive Strength: 11,000 psi (76 MPa), when tested in accordance with ASTM D695.
3. Color: To be selected by Architect from manufacturer's full range.
4. Products:
   a. Pecora Corporation; DynaPoxy EP-1200 Two-Part Epoxy Security Sealant: www.pecora.com/#sle.

J. Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.
1. Products:
   a. CR Laurence Co., Inc.; PTI 707 Butyl Sealant: www.crlaurence.com/3sle.
   b. ITW Polymers Sealants/North Armerica; Acryl-R SM5430: www.itwsealants.com/#sle.
   c. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.
   d. Sika USA; SikaLastomer-511: usa.sika.com/#sle.
   e. Tremco Commercial Sealants and Waterproofing; TremPro JS-773: www.tremcosealants.com/#sle.

2.05 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.

3. Color: To be selected by Architect from manufacturer's full range.
4. Tensile Strength: 150 to 200 psi (1.03 to 1.38 MPa) in accordance with ASTM D412.
5. Products:
   a. Pecora Corporation; Urexpan NR-200: www.pecora.com/#sle.
   b. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.

B. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.

C. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multicomponent, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch (3 mm).
5. Joint Width, Maximum: 3/4 inch (19 mm).
6. Joint Depth: Provide product suitable for joints from 1/2 inch (13 mm) to 2-1/2 inches (64 mm) in depth including space for backer rod.
7. Products:
   a. Dayton Superior Corporation; Sure Fil J52: www.daytonsuperior.com/#sle.
   b. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.

2.06 ACCESSORIES

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

D. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

E. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

F. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Verify that joints are ready to receive work.

C. Verify that backing materials are compatible with sealants.

D. Verify that backer rods are of the correct size.

E. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
   3. Arrange for sealant manufacturer's technical representative to be present during tests.
   4. Record each test on Preinstallation Adhesion Test Log as indicated.
   5. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
   6. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
   1. Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
      a. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
      b. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
         1) Concrete.
         2) Masonry.
         3) Unglazed surfaces of ceramic tile.
      c. Remove laitance and form-release agents from concrete.
      d. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
         1) Metal.
         2) Glass.
         3) Glazed surfaces of ceramic tile.

C. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

E. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
   1. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.
   1. Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
   1. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
      a. Do not leave gaps between ends of sealant backings.
      b. Do not stretch, twist, puncture, or tear sealant backings.
      c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond breaker backing tape where backer rod cannot be used.
   1. Between sealants and backs of joints.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
   1. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
      a. Place sealants so they directly contact and fully wet joint substrates.
      b. Completely fill recesses in each joint configuration.
      c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
   1. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
      a. Remove excess sealant from surfaces adjacent to joints.
      b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
      c. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

I. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

J. Installation of Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch (3 to 6 mm) below adjoining surface.

1. Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

K. Installation of Semi-Rigid Epoxy Joint Filler: Comply with manufacturers written instructions for application of filler.

L. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 CLEANING

A. Clean adjacent soiled surfaces.
1. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.06 PROTECTION

A. Protect sealants until cured.
1. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

1.03 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and borrowed lites.

C. Section 099113 - Exterior Painting: Field painting.

D. Section 099123 - Interior Painting: Field painting.

1.04 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SDI: Steel Door Institute.

G. UL: Underwriters Laboratories.

1.05 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. ITS (DIR) - Directory of Listed Products; Current Edition.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.

P. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

S. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

V. UL (DIR) - Online Certifications Directory; Current Edition.

W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; Current Edition, Including All Revisions.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

D. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of anchorages, joints, field splices, and connections.
   6. Details of accessories.

E. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

F. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

G. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

H. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

B. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer, whenever possible, who is a member of the Steel Door Institute.

C. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

E. Wind Loads: At exterior locations, provide door hardware with hollow metal assemblies capable of withstanding windload design pressures which are calculated, certified, stamped and signed, for this project by a qualifiied/registered professional, licensed in state having jurisdiction, meeting or exceeding the design load requirements as indicated on the structural drawings.

F. Hurricane-Resistance Test Performance- At exterior locations, provide door hardware with hollow metal approved assemblies that pass large missile-impact tests and cyclic-pressure tests according to testing requirements of authorities having jurisdiction.
   1. Impact Resistance- Door Hardware approved assemblies must satisfy the criteria for protection from windborne debris. The assemblies must have passed the large missile impact test (which equates to Missile Level D specified in ASTM E 1996-14a). The assemblies may be installed at any height on the structure as long as the design pressure rating for the assemblies is not exceeded.

G. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

H. Maintain at project site copies of reference standards relating to installation of products specified.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
   1. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
   2. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
      a. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

D. Replace items damaged during delivery, unless damage is minor and can be repaired to match intact systems, as determined by Architect.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

C. Warranty Period: 1 year from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
4. Republic Doors, an Allegion brand; DE Series/Sound Transmission Control (STC) Doors/Flush: www.republicdoor.com/#sle. **BASIS OF DESIGN.**
5. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for

instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

B. Door Finish: Factory primed and field finished.
   1. Manufacturer's standard rust-inhibiting coating, unless specifiied differently, compatible with paint specified in Section 09 9000 - Painting and Coating.

C. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
   4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
   5. Weatherstripping: Integral, recessed into door edge or frame.

D. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Kraftpaper honeycomb.
   3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

E. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 - Seamless.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   3. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
   4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      a. Attach fire rating label to each fire rated unit.
   5. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and

NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;

a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
c. Label: Include the "S" label on fire-rating label of door.

6. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
   1. ANSI/SDI A250.8 (SDI-100), Level 2 and 3 Door Frames: 14 gage, 0.067 inch (1.7 mm), minimum thickness.

B. Frame Finish: Factory primed and field finished.
   1. Manufacturer's standard rust-inhibiting coating compatible with paint specified in Section 09 9000 - Painting and Coating.

C. Exterior Door Frames: Face welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
   2. Frame Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
   3. Weatherstripping: Integral, recessed into frame edge.

D. Interior Door Frames, Non-Fire Rated: Slip-on type at gypsum board walls, and knock-down type at masonry walls.
   1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

E. Door Frames, Fire-Rated: Face welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
   3. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.

B. Floor Anchors:
   1. Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards:
   1. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   2. Formed from same material as frames, not less than 0.016 inches thick.

2.07 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
   1. In Fire-Rated Doors: UL (DIR) or ITS (DIR) listed fusible link louver, same rating as door.
   2. Style: Standard straight slat blade.
   3. Fasteners: Exposed, tamper proof fasteners.

B. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Size: As indicated on drawings.
   2. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel, with finish to match door.

C. Glazing: As specified in Section 088000, factory installed.

D. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

E. Astragals for Double Doors:
   1. Exterior Doors: Steel, Z-shaped.
   2. Fire-Rated Doors: Steel, shape as required for fire rating.

F. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

G. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

H. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

I. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.08 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:
   1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
   2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
   3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames:
   1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Stud Wall Type: 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 high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
9. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.09 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
1. Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
    a. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.
2. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

a. Use at conditions with grouted frames and at conditions with dissimilar metals in close proximity to one another.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.
   1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that opening sizes and tolerances are acceptable.
   1. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer.

C. Verify that finished walls are in plane to ensure proper door alignment.

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

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

C. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

D. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

E. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

F. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
   1. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
   2. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

C. Install fire rated units in accordance with NFPA 80.

D. Coordinate frame anchor placement with wall construction.

E. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.

F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
   1. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

G. Install door hardware as specified in Section 087100.

H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.
   1. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
   2. Adjust doors so that seals are fully engaged when door is closed.
   3. Test doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Weatherstripping.

C. Door hardware.

1.03 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 088000 - Glazing: Glass and glazing accessories.

1.04 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

L. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. General: The following submittal package shall be submitted as a complete package, including the following listed below. Individual submittals will be returned unaccepted until the complete package is submitted.

C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
   1. For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of provisions for system expansion and contraction, as required.
   3. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: For each vertical-to-horizontal intersection of aluminum-framed systems, provide isometric drawings showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   3. Expansion provisions.
   4. Glazing.

G. Report of field testing for water leakage.
   1. Quality Assurance/Control Submittals:
      a. Test reports: Submit certified test reports showing compliance with specified system performance characteristics.

H. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

I. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

J. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

K. Designer's qualification statement.

L. Manufacturer's qualification statement.

M. Installer's qualification statement.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

1. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
    a. System design and associated design calculations are to be sealed and signed by Professional Structural Engineer licensed in the State of Louisiana responsible for overseeing design of system.
2. Design aluminum storefront systems, including perimeter trims, stools, accessories, shims, anchors and perimeter sealing of storefront units capable of withstanding the design loads indicated on structural drawings.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
    a. Insulating Glass Certification Council (IGCC).
    b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
1. Acceptable to manufacturer and capable of preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
2. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Single Source Responsibility: To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

H. Pre-Installation Conference: Conduct conference at Project Site. Notify Architect minimum ten (10) days prior to the conference.
1. Verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
2. Attendees are to include manufacturer's field representative and representatives for all contractors associated with the system and all contractors associated with adjacent materials and systems installed in proximity of the work.

I. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
2. Build mockup of typical wall area as approved by Architect.

3. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standard for fabrication and installation.
4. Field testing shall be performed on mockups according to requirements in “Field Quality Control” Article.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

B. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.
   1. Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
      a. Failures include, but are not limited to, the following:
         1) Structural failures including, but not limited to, excessive deflection.
         2) Deterioration of metals and other materials beyond normal wear.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide ten year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
   1. Manufacturer’s standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer North America; Trifab VersaGlaze 451T: www.kawneer.com/#sle.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   2. YKK; : wwwykkap.com/#sle.

C. Substitutions: See Section 016000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
   2. Finish Color: As selected by Architect from manufacturer's standard line.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.
   10. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
   3. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
   4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.
   2. Cross-Section: As indicated on drawings.

3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: See Section 088000.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Structural Supporting Anchors Attached to Reinforced Concrete Members: Design for welded attachment to weld plates embedded in concrete.

F. Fasteners: Stainless steel.

G. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.

H. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch (0.48 mm) minimum thickness.

I. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch (0.43 mm) minimum thickness.

J. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

K. Sealant for Setting Thresholds: Non-curing butyl type.

L. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

M. Glazing Accessories: See Section 088000.

N. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

O. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Entrances: Install to produce smooth operation and tight fit at contact points.

J. Install glass and infill panels in accordance with Section 088000, using glazing method required to achieve performance criteria.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

C. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch (3 mm).

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for general testing and inspection requirements.

C. Field Tests: Test installed fixed storefront for air leakage and water resistance in accordance with the latest version of AAMA 503 as recognized by the authority having jurisdiction.

D. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of three tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10 percent, 50 percent, and 70 percent completion of this work.

E. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

F. Additional inspection, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Aluminum-framed assemblies will be considered defective if they do not pass inspections.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Hardware for fire-rated doors.

B. Electrically operated and controlled hardware.

C. Lock cylinders for doors with balance of hardware specified in other sections.

D. Thresholds.

E. Weatherstripping and gasketing.

1.03 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 081116 - Aluminum Doors and Frames.

C. Section 281000 - Access Control: Electronic access control devices.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2021.

C. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

D. BHMA A156.3 - Exit Devices; 2020.

E. BHMA A156.4 - Door Closers and Pivots; 2024.

F. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

G. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

H. BHMA A156.7 - Template Hinge Dimensions; 2016.

I. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2022.

J. BHMA A156.15 - Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2021.

K. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.

L. BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors; 2019.

M. BHMA A156.21 - Thresholds; 2019.

N. BHMA A156.22 - Standard for Gasketing; 2021.

O. BHMA A156.26 - Standard for Continuous Hinges; 2021.

P. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

Q. BHMA A156.36 - Auxiliary Locks; 2020.

R. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

S. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

T. DHI (KSN) - Keying Systems and Nomenclature; 2019.

U. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

V. ITS (DIR) - Directory of Listed Products; Current Edition.

W. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

BB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

CC. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

DD. UL 1034 - Standard for Safety Burglary-Resistant Electrical Locking Mechanisms; Current Edition, Including All Revisions.

EE. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; Current Edition, Including All Revisions.

FF. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Attendance Required:
      a. Owner.
      b. Architect.
   2. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Access control requirements.
      b. Key control system requirements.
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

5. Deliver established keying requirements to manufacturers.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Supplier's qualification statement.

I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

J. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

L. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

M. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Thirty five years, minimum.
   2. Locksets: Five years, minimum.
   3. Other Hardware: One year, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

D. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

E. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

F. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

G. See Section 281000 for additional access control system requirements.

H. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.

4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
    a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
    b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
5. Hardware for Smoke and Draft Control Doors: Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
1. BEST; dormakaba Group: www.bestaccess.com/#sle.
2. Bommer.
3. Hager Hinges Co.
4. McKinney, Assa Abloy Group.
5. Approved equal as determined by Architect.

B. Properties:
1. Butt Hinges: As applicable to each item specified.
    a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
    b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
    c. Template screw hole locations.
    d. Bearing assembly installed after plating.
    e. Bearings: Exposed fully hardened bearings.
    f. Bearing Shells: Shapes consistent with barrels.
    g. Pins: Easily seated, non-rising pins.
        1) Fully plate hinge pins.
        2) Non-Removable Pins: Slotted stainless steel screws.
    h. UL 10C listed for fire-resistance-rated doors.
2. Continuous Hinges: As applicable to each item specified.
    a. Pin and Barrel Continuous Hinges: As applicable to each item specified.
        1) Material: Fabricated from 14 gauge, 0.067 inch (1.7 mm) steel.
        2) Slim barrel design.

3) Twin nylon self-lubricating bearings located between all knuckles except top and bottom.
4) Two stainless steel bearings top and bottom, to prevent sagging if nylon bearings degrade during a fire.

C. Sizes: See Door Hardware Schedule.
1. Hinge Widths: As required to clear surrounding trim.
2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
1. Fully polish hinges; front, back, and barrel.

E. Grades:
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Pin-and-Barrel Hinges Standards Compliance: UL and ULC listed for fire-resistance rated 4 foot (121.92 cm) by 8 foot (243.84 cm) single doors and 8 foot (243.84 cm) by 8 foot (243.84 cm) pairs up to 3 hours.

G. Material: Base metal as indicated for each item by BHMA material and finish designation.

H. Types:
1. Butt Hinges: Include full mortise hinges.
2. Continuous Hinges: Include geared and pin and barrel hinges.

I. Options: As applicable to each item specified.
1. Provide dutch door prep as listed in the hardware sets.

J. Quantities:
1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
a. Hinge weight and size unless otherwise indicated in hardware sets:
1) For doors up to 36 inches (914.4 mm) wide and up to 1-3/4 inches (44 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
2) For doors from 36 inches (914.4 mm) wide up to 42 inches (1066.8 mm) wide and up to 1-3/4 inches (44 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.68 mm) and a minimum of 4-1/2 inches (114 mm) in height.
3) For doors from 42 inches (1066.8 mm) wide up to 48 inches (1219.2 mm) wide and up to 1-3/4 inches (44 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.57 mm) and a minimum of 5 inches (127 mm) in height.
4) For doors greater than 1-3/4 inches (44 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.57 mm) and a minimum of 5 inches (127 mm) in height.
2. Continuous Hinges: One per door leaf.

K. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

L. Products:
1. Butt Hinges:
a. Ball Bearing, Five (5) Knuckle.
2. Continuous Hinges:

2.04 BOLTS

A. Manufacturers:
   1. ABH Manufacturing
   2. Ives, Allegion Group.
   3. Rockwood, Assa Abloy Group.
   4. Trimco: www.trimcohardware.com/#sle.
   5. Approved equal as determined by Architect.

B. Properties:
   1. Flush Bolts:
      a. Manual Flush Bolts: Manually latching upon closing of door leaf.
         1) Bolt Throw: 3/4 inch (19.05 mm), minimum.
   2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.

C. Options:
   1. Extension Bolts: In leading edge of door, one bolt into floor, one bolt into top of frame.

D. Products:
   1. Manual flush bolts.

2.05 EXIT DEVICES

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Sargent, Assa Abloy Group.
   3. Von Duprin, Allegion Group.
   4. Approved equal as determined by Architect.

B. Properties:
   1. Actuation: Full-length touchpad.
   2. Touchpads: 'T” style metal touchpads and rail assemblies with matching chassis covers end caps.
   3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19.05 mm) projection using latch bolt.
   4. Lever Design: Match project standard lockset trims.
   5. Cylinder: Include where cylinder dogging or locking trim is indicated.
   6. Strike as recommended by manufacturer for application indicated.
   7. Sound dampening on touch bar.
   8. Dogging:
      a. Fire-Resistance-Rated Devices: Manual dogging not permitted.
   9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.35 mm) clearance to allow for vision frames.
   10. All exposed exit device components to be of architectural metals and “true” architectural finishes.
   11. Handing: Field-reversible.
   12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
   13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
   1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

D. Options:
   1. Internally mounted switch used to signal other components.

2. MLR: Motorized latch retraction.

E. Products:
1. 2000.

2.06 REMOVABLE MULLIONS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Von Duprin, Allegion Group.
4. Approved equal as determined by Architect.

B. Properties:
1. Rectangular shape 3 inches (76.2 mm) by 2 inches (50.8 mm) tubes with minimum 1/8 inch (3.18 mm) wall thickness.
2. Furnished by the same manufacturer as exit devices.
3. Pre-drilled holes for installation of exit device strikes.
4. Spacers: Provide as required for proper installation, based on frame profile and dimensions.

C. Grades: Complying with BHMA A156.3.

D. Materials: Manufacturer's standard for items specified.
1. Top and Bottom Brackets: Investment-cast steel.

E. Options:
1. Furnish Keyed Removable “KR” feature and corresponding cylinders as specified.
a. Mullions capable of being installed without physical key present.
b. Physical key required to operate.

F. Applications: As indicated on drawings and in Door Hardware Schedule.
1. Fire-Resistance-Rated Openings: Mullions with UL Listed Labels and mullion stabilizers.

G. Products:
1. 822 Series.

2.07 LOCK CYLINDERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Schlage, Allegion Group.
4. Approved equal as determined by Architect.

B. Properties:
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
a. Provide cylinders from same manufacturer as locking device.
b. Provide cams and/or tailpieces as required for locking devices.
c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:
1. Manufacturer's standard corrosion-resistant brass alloy.

E. Types: As applicable to each item specified.

F. Applications: At locations indicated in hardware sets, and as follows

1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
    a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:
1. Rim/mortise.

2.08 CYLINDRICAL LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent, Assa Abloy Group.
3. Schlage, Allegion Group.
4. Approved equal as determined by Architect.

B. Properties:
1. Mechanical Locks:
    a. Fitting modified ANSI A115.2 door preparation.
    b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
    c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
        1) Through-bolted anti-rotational studs.
    d. Bored Hole: 2-1/8 inch (54 mm) diameter.
    e. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
    f. Latch: Single piece tail-piece construction.
        1) Latchbolt Throw: 9/16 inch (14.29 mm), minimum.
    g. Cylinders:
        1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
    h. Lever Trim:
        1) Style: See Door Hardware Schedule.
        2) Outside Lever Sleeve: Seamless one-piece construction.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.

E. Material: Manufacturer's standard for specified lock.

F. Products: Cylindrical locks, including mechanical and electrified types.
1. BEST, 9K Series.

2.09 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. ABH Manufacturing
2. Trimco: www.trimcohardware.com/#sle.
3. Approved equal as determined by Architect.

B. Properties:
1. Pull Type: Straight with additional piece to allow opening the door without gripping the handle.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.

a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:
1. Push-Pull Plates.

2.10 CLOSERS

A. Manufacturers:
1. BEST, dormakaba Group www.bestaccess.com/#sle.
2. LCN, Allegion Group.
3. Approved equal as determined by Architect.

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
a. Construction: Single piece casted cast iron housing.
b. Maximum Projection from Face of Door: 2-7/16 inches (62 mm).
c. Mechanism: Separate, tamper-resistant, retention ring, self-regulating adjusting valves for closing and latching speeds, backcheck, advanced variable backcheck and optional delayed action feature.
1) All valve adjustment socket screw drives must be slotted hex not requiring special tools for maintenance or adjustments.
2) Spring adjustment screw must be hex key.
3) All valves must have mechanism to prevent oil leaks from over adjustment.
4) All closer adjustments must be front facing and adjustable without removing closer from installed surface.
5) Advanced Variable Backcheck: Backcheck positioning adjustment (POS)
(a) Selectable adjustment to facilitate degree of backcheck engagement point:
(1) Parallel arm mount: 50 degrees.
(2) Regular arm and top jamb mount: Between 50 and 80 degrees.
(b) Intensity of backcheck shall be fully adjustable with tamper resistant non-critical valve screw.
6) Spring Size:
(a) Adjustable spring sizes 1-6 with +50% power increase capability.
(b) Spring size indicator shall be easy to read, located front facing on the housing and adjustable without removal of housing from the installed surface.
d. Hydraulic: All-weather fluid.
e. Arm Assembly:
1) Construction: Stamped arms and forged hub.
2) Material: Steel.
3) Degree of Swing:
(a) Parallel arm NHO mounting shall not limit opening angle and permit 180-degree door swing.
(b) Regular arm NHO mounting shall not limit opening angle and permit 120-degree door swing.
(c) Consult factory for non-standard templating.
4) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
5) Where obstructions limit opening angle and wall or floor stops are prohibited, provide “IS” or “S-IS” arms.

f. Covers:
1) Type:
(a) Full. (standard)
2) Material:
(a) Plastic. (standard)
3) Finish:
(a) Painted. (standard)
4) Attachment: Two-point flange mounting, dual-clamp friction fit closer cover.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) CAN/ULC S-133 - Standard Method Of Tests For Door Closers Intended For Use With Swinging Doors.
b. Testing Standards Compliance: Meeting requirements of UL 10C for positive pressure.

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

E. Options:
1. Delayed action, adjustable with an independent valve.

F. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At out swinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

G. Products:
1. Surface Mounted:
a. EHD9000

2.11 PROTECTION PLATES

A. Manufacturers:
1. Don-Jo.
2. Ives, Allegion Group.
3. Rockwood, Assa Abloy Group.
4. Approved equal as determined by Architect.

B. Properties:
1. Plates:
a. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface. Include integral edge guard at locations indicated in the hardware schedule.
b. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
c. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.

d. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

2.12 STOPS AND HOLDERS

A. Manufacturers:
1. Don-Jo.
2. Ives, Allegion Group.
3. Rockwood, Assa Abloy Group.
4. Trimco: www.trimcohardware.com/#sle.
5. Approved equal as determined by Architect.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
1. Wall Bumpers: Bumper, concave, wall stop.

F. Installation:
1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
1. Wall Bumpers.

2.13 THRESHOLDS

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Pemko, Assa Abloy Group.
3. Zero, Allegion Group.
4. Approved equal as determined by Architect.

B. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Verify project conditions to ensure specified thresholds will function as intended. Provide barrier-free type at every location where specified.
1. Bumper Seal Thresholds with Gasket: Use silicone gaskets.

2.14 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Pemko, Assa Abloy Group.
3. Zero, Allegion Group.

B. Properties:

1. Adhesive-Backed Perimeter Gasketing: Slilicone gasket material applied to frame with self- adhesive.
2. Rigid, Housed, Perimeter Gasketing: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with screws.
3. Door Sweeps: Silicone gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.

C. Grades: Comply with BHMA A156.22.

2.15 MISCELLANEOUS ITEMS

A. Manufacturers:
1. Don-Jo.
2. Ives, Allegion Group.
3. Rockwood, Assa Abloy Group.
4. Trimco: www.trimcohardware.com/#sle.
5. Approved equal as determined by Architect.

B. Properties:
1. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   a. Single Door: Provide three on strike jamb of frame.
   b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   c. Material: Rubber, gray color.

C. Products:
1. Silencers.

2.16 KEYS AND CORES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
1. Provide small format interchangeable core.
2. Provide Patented CORMAX keys and cores.
3. Provide keying information in compliance with DHI (KSN) standards.
4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
5. Keying: Master keyed. Key to Owner's existing key system.
6. Include construction keying and control keying with removable core cylinders.
7. Supply keys in following quantities:
   a. Master Keys: 4 each.
   b. Construction Master Keys: 6 each.
   c. Construction Keys: 15 each.
   d. Construction Control Keys: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."

11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
1. Patented:
a. CORMAX.

2.17 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

J. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 HARDWARE SCHEDULE

MANUFACTURER LIST

ABH	**ARCHITECTURAL BUILDERS HARDWARE**
BES	**BEST**
PRE	**BEST (PRECISION)**
D-J	**DON-JO**
DK	**DORMAKABA**
NGP	**NATIONAL GUARD PRODUCTS**

OPTION LIST

CODE	NAME
(1/4-20 MS/EA)	**1/4-20 MACHINE SCREW/EXPANSION ANCHOR**
1" LDW	**1" LESS DOOR WIDTH**
4" ODW	**4" OVER DOOR WIDTH**
B4E	**BEVELED 4 EDGES**
CSK	**COUNTERSUNK HOLES**
FL	**FIRE RATED HARDWARE**
LAR	**LENGTH AS REQUIRED**
NRP	**NON-REMOVABLE PINS**

FINISH LIST

CODE	NAME
26D	**SATIN CHROME**
32D	**SATIN STAINLESS STEEL**
626	**SATIN CHROME**
630	**SATIN STAINLESS STEEL**
689	**ALUMINUM**
A	**ANODIZED ALUMINUM**
C	**CHARCOAL**
US26D	**SATIN CHROME**
US28	**CLEAR ANODIZED ALUMINUM**
US32D	**BRUSHED STAINLESS STEEL**

SPECIFICATION REPORT

SET #1

DOORS: 319A, 330B

3	HINGE	FBB191 NRP 45X45	32D	BES
1	EXIT DEVICE	2101	630	PRE
1	DOOR CLOSER	EHD90 16 DS90	689	BES
1	THRESHOLD	896 S LAR (1/4-20 MS/EA)	A	NGP
1	GASKETING	110S HEAD & JAMBS (2)	A	NGP
1	SWEEP	200S LAR	A	NGP
1	DRIP CAP	16 4" ODW	A	NGP

SET #2

DOORS: 300B, 200B, 200C, 102A

6	HINGE	FBB179 45X45	26D	BES
1	REMOVEABLE MULLION	KR822	689	PRE
2	EXIT DEVICE	2108 A 4908	630	PRE
3	RIM CYLINDER	12E72 CORMAX	626	BES
2	DOOR CLOSER	EHD90 16 AF90P	689	BES
2	WALL STOP	1407	630	D-J
1	GASKETING	5100N MULLION		NGP
2	SILENCERS	1608	GRAY	D-J

SET #3

DOORS: 300C, 301

6	HINGE	FBB179 45X45	26D	BES
1	REMOVEABLE MULLION	FLKR822	689	PRE
2	EXIT DEVICE	FL 2108 A 4908	630	PRE
3	RIM CYLINDER	12E72 CORMAX	626	BES
2	DOOR CLOSER	EHD90 16 AF90P	689	BES
2	WALL STOP	1407	630	D-J
1	GASKETING	5100N		NGP
1	GASKETING	5050 HEAD & JAMBS (2)	C	NGP

SET #4

DOORS: 319B, 330A

6	HINGE	FBB179 45X45	26D	BES
1	FLUSHBOLT	1860P	US26D	ABH
1	DUST PROOF STRIKE	1870	US26D	ABH
1	CYLINDRICAL LOCK	9K 3 7 AB 15 C S3 CORMAX	626	BES
1	COORDINATOR	3700 SERIES	US28	ABH
2	MOUNTING BRACKET	3751 / 3752 AS REQ'D	US28	ABH
2	DOOR CLOSER	EHD90 16 AF90P	689	BES

2	PROTECTION PLATE	90 10" 1" LDW CSK B4E	630	D-J
2	WALL STOP	1407	630	D-J
1	ASTRAGAL	139SP LAR	US32D	NGP
2	SILENCERS	1608	GRAY	D-J

SET #5

DOORS: 307

6	HINGE	FBB179 45X45	26D	BES
1	FLUSHBOLT	1860P	US26D	ABH
1	DUST PROOF STRIKE	1870	US26D	ABH
1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES
1	COORDINATOR	3700 SERIES	US28	ABH
2	MOUNTING BRACKET	3751 / 3752 AS REQ'D	US28	ABH
2	DOOR CLOSER	EHD90 16 DS90	689	BES
2	PROTECTION PLATE	90 10" 1" LDW CSK B4E	630	D-J
1	ASTRAGAL	139SP LAR	US32D	NGP
3	SILENCERS	1608	GRAY	D-J

SET #6

DOORS: 302

6	HINGE	FBB179 45X45	26D	BES
1	FLUSHBOLT	1855P	US26D	ABH
1	DUST PROOF STRIKE	1870	US26D	ABH
1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES
2	OVERHEAD STOP	90 2 S	689	DK
1	ASTRAGAL	139SP LAR	US32D	NGP
2	SILENCERS	1608	GRAY	D-J

SET #7

DOORS: 305

6	HINGE	FBB179 45X45	26D	BES
1	FLUSHBOLT	1855P	US26D	ABH
1	DUST PROOF STRIKE	1870	US26D	ABH
1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES
2	WALL STOP	1407	630	D-J
1	ASTRAGAL	139SP LAR	US32D	NGP
2	SILENCERS	1608	GRAY	D-J

SET #8

DOORS: 308

6	HINGE	FBB179 45X45	26D	BES
1	FLUSHBOLT	1855P	US26D	ABH
1	DUST PROOF STRIKE	1870	US26D	ABH

1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES
2	PROTECTION PLATE	90 10" 1" LDW CSK B4E	630	D-J
2	WALL STOP	1407	630	D-J
1	ASTRAGAL	139SP LAR	US32D	NGP
2	SILENCERS	1608	GRAY	D-J

SET #9

DOORS: 201A

3	HINGE	FBB179 45X45	26D	BES
1	EXIT DEVICE	FL 2108 A 4908	630	PRE
1	RIM CYLINDER	12E72 CORMAX	626	BES
1	DOOR CLOSER	EHD90 16 AF90P	689	BES
1	WALL STOP	1407	630	D-J
1	GASKETING	5050 HEAD & JAMBS	C	NGP

SET #10

DOORS: 202

3	HINGE	FBB179 45X45	26D	BES
1	CYLINDRICAL LOCK	9K 3 7 AB 15 D S3 CORMAX	626	BES
1	WALL STOP	1407	630	D-J
3	SILENCERS	1608	GRAY	D-J

SET #11

DOORS: 304

3	HINGE	FBB179 45X45	26D	BES
1	PULL PLATE	AB107 X AB70C	US32D	ABH
1	PUSH PLATE	AB70C-RKW	US32D	ABH
1	DOOR CLOSER	EHD90 16 AF90P	689	BES
1	WALL STOP	1407	630	D-J
1	GASKETING	5050 HEAD & JAMBS (2)	C	NGP

SET #12

DOORS: 306

3	HINGE	FBB179 45X45	26D	BES
1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES
1	OVERHEAD STOP	90 2 S	689	DK
3	SILENCERS	1608	GRAY	D-J

SET #13

DOORS: 309, 209

3	HINGE	FBB179 45X45	26D	BES
1	CYLINDRICAL LOCK	9K 3 7 D 15 D S3 CORMAX	626	BES

1	**WALL STOP**	**1407**	**630**	**D-J**
3	**SILENCERS**	**1608**	**GRAY**	**D-J**

SCHEDULE:

OPENING NUMBER:	HARDWARE SET
102A	2
200B	2
200C	2
201A	9
202	10
209	13
300B	2
300C	3
301	3
302	6
304	11
305	7
306	12
307	5
308	8
309	13
319A	1
319B	4
330A	4
330B	1

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.03 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers.

B. Section 072700 - Air Barriers.

C. Section 084313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.04 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1036 - Standard Specification for Flat Glass; 2021.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).

I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

M. BS EN 14179-1 - Glass in Building - Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass - Part 1: Definition and Description; 2016.

N. GANA (GM) - GANA Glazing Manual; 2022.

O. GANA (SM) - GANA Sealant Manual; 2008.

P. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.

Q. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

R. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

S. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.05 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

E. Deterioration of Coated Glass: Defects developed from normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

F. Deterioration of Laminated Glass: Defects developed from normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

G. Visible light transmittance: The ratio of the amount of visible light (380-780 nm) that is allowed to pass through a glazing system to the amount of visible light falling on the glazing system. The value is expressed as a percentage.

H. Diffuse visible light reflectance (exterior): The percentage of visible light falling on a flat, non-mirrored surface, that is neither transmitted nor absorbed but scattered backwardly at random angles from that surface. This value is also known as “non-specular reflectance.

I. Privacy film rating: This number, between 0 (clear) and 10 (opaque), represents the relative difficulty an observer has in identifying the nature and character of an object located on the opposite side of the window, with the observer and the object both located at least 2 feet from the pane upon which the product has been installed.

J. Gradient Series: These films are intended to give graduated privacy while still allowing for a sense of openness. Partially block out views, selectively hide unattractive areas or add a fresh design element easily with this versatile series.

1.06 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Design Loads for glazing system, components and cladding wind loads determined in accordance with ASTM E 1996, for the parameters specified.

1. Design Loads: Refer to structural drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. Specified Design Wind Loads: As indicated on structural drawings, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
      b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
      d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
      e. Windborne-Debris-Impact-Resistance-Test Performance: Provide glazing for aluminum-framed systems that pass large and small missile-impact tests and cyclic-pressure tests according to the requirements of The International Building Code.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 6.0 mm thick and a nominal 1/2-inch- (12.7-mm) wide interspace.
   3. For laminated-glass lites, properties are based on products of construction indicated.

F. Impact Resistance: System to meet requirements for coastal hurricane missile impact loads.
   1. Glazed aluminum curtain wall up to 30 feet above grade shall be designed for Large Missile Impact (LMI) in accordance with ASTM E1996.
   2. Glazed aluminum curtain wall frame 30 feet to 60 feet above grade shall be designed for Small Missile Impact (SMI) in accordance with ASTM E1996.

G. Decorative Film:
   1. Scratch Resistance: Decorative films shall average less than 12 percent increase in haze when tested according to ASTM D1044 using a Teledyne Taber Abrader using CS10F Type III wheels each loaded to 0.5 kg for 100 cycles in a 70 percent vacuum.
      a. Scratch resistance testing shall be performed by an independent third party agency.
   2. Surface Burning Characteristics: Provide films that have Flame Spread Index of 0 and Smoke Developed Index of 30 or less when tested in accordance with ASTM E84.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review temporary protection requirements for glazing during and after installation.

1.08 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (305 by 305 mm) in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.09 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), and GANA (LGRM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. A qualified insulating-glass manufacturer/fabricator who is approved and certified by coated-glass manufacturer. Manufacturer/Fabricator to provide references and submit project experience documentation of similar scope that have incorporated high-performance, low-e coated glass products, with a record of successful in-service performance..
   2. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. North American Contractor Certification (NACC) for glazing contractors.
      b. Equivalent independent third-party ANSI accredited certification.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

E. Source Limitations for Glass: Obtain tinted float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.

F. Glass Distortion Standard for heat-treated glass sized 6.0 mm or thicker:
   1. Distortion Tolerance: Roll wave peak-to-valley (PV) not to exceed .003 center/.008 edges.
   2. Millidiopter: 90 percent of surface not to exceed +/- 120 millidiopters.
   3. Monitoring: Every lite measured with an on-line distortion measurement system.
   4. Bow/Warp Tolerance: Maximum tolerance for bow/warp is 1/2 of ASTM C1048.
   5. Measure glass lites for optical distortion by on-line distortion measurement system. All documentation shall be recorded and available to the Architect upon request.

G. Insulated Glass Unit Standard for insulated glass unit integrity:
   1. Insulated Glass Unit Seal/Sealant.
      a. A "Butterfly Unit Adhesion Pull Test" shall be performed at every shift or carton change. This test is to check the adhesion of the primary sealant to the spacer and the glass.
      b. The center air space is to be measured every hour to help prevent concave/convex insulating glass units.
   2. Sealant/Application Types:
      a. Insulated glass units can have no skips or voids in the primary or secondary seals.
      b. The fabricator must be able to meet architectural aesthetic requirements for primary and secondary seals.
      c. All documentation shall be recorded and available to the Architect upon request.

H. Color Quality Standards:
   1. Manufacturing Facilities:
      a. Manufacturer will employ stringent quality control procedures to ensure the coated glass delivered to their certified network of glazing system fabricators is of the highest standard.
      b. These procedures will include the use of both on-line continuous color measurements as well as regular quality control checks using off-line measurement instrumentation.
      c. Tolerances for color variation will be less than as prescribed in ASTM C1376.

I. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants and provide results to the Architect for review.

J. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
   1. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

K. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: GANA Laminated Division's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual".

L. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council (IGCC).

1.10 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with the specified glazing components.
   1. Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   2. Install glazing in mock-ups specified in Division 08 to match glazing systems required for Project, including glazing methods.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.
   1. If not disturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.12 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.13 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

a. Air Barriers: See Section 072700.

2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

A. General:
1. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
a. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
b. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
2. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

B. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
a. Where fully tempered is specified or required, provide glass that has been tempered by the tong-less horizontal method.
1) Tong method is acceptable if tong marks are concealed in glazing channel.
4. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with BS EN 14179-1.
5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
2. Polyvinyl Butyral (PVB) Interlayer: 0.090 inch (2.286 mm) thick, minimum.
3. Where fully tempered is specified or required, provide glass that has been tempered by the tong-less horizontal method.
a. Tong method is acceptable if tong marks are concealed in glazing channel.

2.03 INSULATING GLASS UNITS

A. Manufacturers:
   1. Guardian Glass, LLC: www.guardianglass.com/#sle.
   2. Pilkington North America Inc: www.pilkington.com/na/#sle.
   3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle. **BASIS OF DESIGN**.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Total Thickness: 1 inch (25.4 mm).
   4. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.293 Btu/hr-ft2-F, nominal.
   5. Visible Light Transmittance (VLT): 69 percent, nominal.
   6. Solar Heat Gain Coefficient (SHGC): 0.38, nominal.
   7. Visible Light Reflectance, Outside: 11 percent, nominal.
   8. Glazing Method: Dry glazing method, gasket glazing.
   9. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   10. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   11. Metal Edge Spacers: Aluminum, bent and soldered corners.
   12. Spacer Color: Black.
   13. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   14. Color: Black.
   15. Purge interpane space with dry air, hermetically sealed.
   16. Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   17. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.

a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 70 glass on #2 surface.
b. Glass Tint: Solargray (light-gray).

18. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick.
    a. Coating: No coating on inboard lite.
    b. Glass: Clear.
19. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another acceptable manufacturer.
20. Substitution Procedures: See Section 016000 - Product Requirements.
    a. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.05 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Other locations required by applicable federal, state, and local codes and regulations.
      c. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.
   5. Visible Light Transmittance (VLT): 91 percent, nominal.
   6. Solar Heat Gain Coefficient (SHGC): 0.89, nominal.
   7. Visible Light Reflectance, Inside: 8 percent, nominal.

2.06 GLAZING COMPOUNDS

A. Glazing compounds identified in this section are specific to the installation of glazing within storefront, curtain wall, door and window systems. These materials are not to come in contact with any adjacent building materials other than those immediate to the glazing installation.

B. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Manufacturers:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Momentive Performance Materials, Inc: www.momentive.com/#sle.
   3. Pecora Corporation: www.pecora.com/#sle.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: EPDM, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

2.08 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide shop inspection and testing for Type G-8 glass.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Resilient sound isolation clips.

E. Acoustic insulation.

F. Gypsum sheathing.

G. Cementitious backing board.

H. Gypsum wallboard.

I. Joint treatment and accessories.

J. Water-resistive barrier over exterior wall sheathing.

K. Noise barriers in gypsum board assemblies.

1.03 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 054000 - Cold-Formed Metal Framing: Structural steel stud framing.

C. Section 072700 - Air Barriers: Air- and water-resistive barrier over sheathing.

D. Section 078400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

E. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.04 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.

K. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

L. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

M. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

N. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.

O. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.

P. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2025.

Q. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2025.

R. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).

S. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

T. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

U. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2024.

V. ASTM E413 - Classification for Rating Sound Insulation; 2022.

W. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

X. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

Y. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

D. SSFSA Manufacturer Qualification: Submit documentation of manufacturer association membership.

E. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. All metal framing materials are to be sole sourced from a single manufacturer.

D. All board materials are to be sole sourced from a single manufacturer.

E. Apply acoustical sealant in accordance with applicable requirements of ASTM C919 at all openings and as shown on partition types.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion, under cover and above grade.

C. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.08 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Sound-Rated: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 38-40 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Intermittent loads of 7.5 lbf/sq ft (0.36 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

E. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:
   1. ICC-ES Evaluation Report No. _____.

F. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire-Resistance-Rated Partitions: UL listed assembly No. V465; 1-hour and 2-hour rated as noted on Drawings.
   2. Fire-Resistance-Rated Shaft Walls: UL listed assembly No. U-415 System B; 2- hour rating.
   3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Marino: www.marinoware.com/#sle.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

C. Structural Steel Framing for Application of Gypsum Board: See Section 054000.

D. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
   1. Material Characteristics:
      a. Minimum Thickness of base metal (uncoated) metal and depth:
         1) Nominal 20 gage (33 mil) minimum unless otherwise indicated on drawings.
         2) Nominal 16 gage minimum at at door jambs and interior partitions as indicated on drawings. See Section 05 4000 - Cold-Formed Metal Framing.
            (a) Two studs at each jamb.
         3) Depth: As indicated on drawings.
      b. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized, unless otherwise indicated.
   2. Studs: C-shaped with knurled or embossed faces.
      a. Flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch wide minimum lip (return).
   3. Runners: U shaped, sized to match studs.
   4. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated complying with ASTM A 653, length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
      a. Thickness: 0.027-inch unless otherwise indicated or otherwise required by manufacturer of items being installed.
   5. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
      a. Depth: 1-1/2 inches (38.1 mm).
      b. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
   6. Ceiling Channels: C-shaped.
      a. Ceiling Channels: C-shaped.

1) Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0598 inch (1.5 mm) and minimum 7/16-inch- (11.1-mm-) wide flanges, with ASTM A 653, G60 hot-dip galvanized coating:
   (a) Carrying Channels: 1-1/2 inches (38 mm) deep, unless otherwise indicated.
   (b) Furring Channels: 3/4-inch deep, unless otherwise indicated.
2) Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
3) Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

7. Steel Studs for Furring: ASTM C 645, with flange edges bent back 90 deg and double over to form 3/16-inch minimum lip (return). Use for primary suspension members where indicated.
8. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
   a. Use for secondary suspension members where indicated.
   b. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
   c. Protective coating: ASTM A 653, G 60 (ASTM A 653M, Z180) hot-dip galvanized.
9. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (13 mm) channel depth.
   a. Products:
      1) Same manufacturer as other framing materials.
   b. For attachment to substrate through one leg only.
   c. Manufacturer’s standard product designated to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 or ASTM A 568.
   d. Asymmetric-shaped channel with face connected to a single flange by a single-slotted leg (web) or hat-shaped channel, with 1-1/2-inch wide face connected to flanges by double-slotted or expanded-metal legs.
10. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation performance of wall and floor-ceiling assemblies.
11. Noise Barriers: Mass loaded vinyl interlayer in acoustical gypsum board assemblies as indicated on drawings.
    a. Roll Width: 54 inches (1372 mm).
    b. Roll Length: 30 feet (9 m).

E. Loadbearing Studs for Application of Gypsum Board: As specified in Section 054000.

F. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
   1. Products:
      a. Same manufacturer as other framing materials.
   2. Protective coating: ASTM A 653, G 60 (ASTM A 653M, Z180) hot-dip galvanized.
   3. Shape: Manufacturer's standard "CH, E, or CT" stud as applicable for installation.

G. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
   3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
    a. Products:
        1) ClarkDietrich; BlazeFrame RipTrak: www.clarkdietrich.com/#sle.
        2) FireTrak Corporation; Posi Klip: www.fire-trak.com/#sle.
        3) Metal-Lite, Inc; The System: www.metal-lite.net/#sle.
        4) Super Stud Building Products, Inc; Slotted Deflection Track: www.buysuperstud.com/#sle.

H. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

I. Preformed Top Track Firestop Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

J. Non-structural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

K. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.

L. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.03 BOARD MATERIALS

A. Abuse Resistant Wallboard:
1. Application: All new interior partitions indicated on the Drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
4. Type: Fire-resistance-rated Type X, UL or WH listed.
5. Thickness: 5/8 inch (16 mm).
6. Edges: Tapered.
7. Glass Mat Faced Products:
    a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme AR Gypsum Panel: www.goldbondbuilding.com/#sle.
    b. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

B. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    a. Thickness: 1/2 inch (13 mm).
    b. Products:
        1) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.

2) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 5/8 in. (15.9 mm): www.usg.com/#sle.

4. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
   a. Regular Type: Thickness 1/2 inch (13 mm).
   b. Products:
      1) CertainTeed Corporation; 1/2" GlasRoc Tile Backer: www.certainteed.com/#sle.
      2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
      3) Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Tile Backer: www.goldbondbuilding.com/#sle.
      4) USG Corporation; Durock Brand Glass-Mat Tile Backerboard 1/2 in. (12.7 mm): www.usg.com/#sle.
      5) Substitutions: See Section 016000 - Product Requirements.

C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   4. Core Type: Regular and Type X, as indicated.
   5. Type X Thickness: 5/8 inch (16 mm).
   6. Regular Board Thickness: 5/8 inch (16 mm).
   7. Edges: Square.
   8. Glass Mat Faced Products:
      a. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing: www.gpgypsum.com/#sle.
      b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Sheathing: www.goldbondbuilding.com/#sle.
      c. USG Corporation; Securock Brand UltraLight Glass-Mat Sheathing Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

D. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (600 mm) wide, beveled long edges, ends square cut.
   1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass Mat Faced Products:
      a. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant): www.gpgypsum.com/#sle.
      b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Shaftliner: www.goldbondbuilding.com/#sle.
      c. USG Corporation; Sheetrock Brand Glass-Mat Liner Panels Mold Tough 1 in. (25.4 mm): www.usg.com/#sle.
   4. Framing: Gypsum Liner Panels attach to metal framing; as indicated on Drawings studs. Refer to product data sheet for additional information.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch (76 mm).
   1. Wall System STC Rating: 50, similar to U.L. Design No. U419.
   2. Manufacturers:
      a. Thermafiber; Sound Attenuation Fire Blankets (SAFB): www.thermafiber.com.

b. Roxul, Inc.; Acoustical Fire Batt (AFB): www.rspec.com.
c. Johns Manville International, Inc.; MinWool Sound Attenuation Fire Batts: www.jm.com.

B. Acoustical Shielding: Recycled ethylene vinyl acetate (EVA) sheet membrane; applied between studs and gypsum board.
1. Sound Transmission Class (STC): Minimum of 25, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
2. Fire Resistance: Where fire-resistance rating is specified for the wall in which the acoustical shielding membrane is mounted, provide assemblies that have been tested in accordance with ASTM E119 for the same rating as the wall.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Provide fire-rated acoustic sealant matching rated wall assembly requirements.

D. Air Barrier: See Section 072700.

E. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924M G90, or rolled zinc, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
3. Products:
a. Same manufacturer as framing materials.
4. Provide accessories as required to achieve industry standard for detail indicated, whether or not specific accessories are shown on drawings.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Setting type, field-mixed.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches (600 mm) on center.
2. Install studs at spacing required to meet performance requirements.
3. Coordinate shaft wall system with elevator shaft requirements for selected elevator system. Refer to drawings and specification Section 14 Elevators.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with manufacturer recommended fire-rated acoustical sealant as required to meet fire resistance requirement.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure, where indicated, or a minimum of 12 inches (305 mm) above ceiling and braced to structure above, as indicated or required.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete, masonry, and veneered walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
   1. Orientation: Vertical or Horizontal, as required for installation.
   2. Spacing: At 16 inches on center (At 400 mm on center).
   3. Size as indicated by furring type.

F. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

G. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

H. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

C. Acoustical Shielding: Install in accordance with manufacturer's instructions for application between studs and gypsum board.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

G. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

H. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
   2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

D. Reveals: Install at locations where gypsum board abuts dissimilar materials and as indicated on plans.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 3: Walls to receive textured wall finish.
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

6. Level 0: Temporary partitions.
7. Level 0: Surfaces indicated to be finished in later stage of project.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
3. Taping, filling, and sanding are not required at base layer of double-layer applications.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.09 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Tile for wall applications.

B. Cementitious backer board as tile substrate.

C. Ceramic accessories.

D. Ceramic trim.

1.03 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.04 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2023.

B. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

C. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2023.

E. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

F. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Certificate: Certify products of this section meet or exceed specified requirements.

F. Installer's qualification statement.

1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation; www.tile-assn.com/#sle

2. Submit documentation of completion of apprenticeship and certification programs.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than one box of each type.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
1. Company specializing in performing tile installation, with minimum of five years of documented experience.
2. Installer Certification:
a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
b. Advanced Certifications for Tile Installers (ACT): Certification in the installation of membranes, mortar bed (mud) floors, mortar (mud) walls, and grouts.

1.08 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct tile mock-up incorporating components specified for location.
1. Minimum size of mock-up is indicated on drawings.
2. Mock-up may not remain as part of work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
1. American Olean Corporation: www.americanolean.com/#sle.
2. Dal-Tile Corporation; Color Wheel Collection - Classic: www.daltile.com/#sle. **BASIS OF DESIGN**.
3. Florim USA: www.milestonetiles.com/#sle.

B. Glazed Wall Tile: ANSI A137.1 standard grade.
1. Size: 6 by 6 inch (152 by 152 mm), nominal.
2. Edges: Cushioned.
3. Surface Finish: Semi-Gloss.
4. Color(s): To be selected by Architect from manufacturer's full range.
5. Pattern: As determined by Architect.
6. Trim Units: Matching cove shapes in 6 inches tall x 6 inches wide (152 mm x 152 mm).

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching cove base ceramic shapes in sizes coordinated with field tile.
   1. Manufacturers: Same as for tile.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. Custom Building Products: www.custombuildingproducts.com/#sle.
   2. LATICRETE International, Inc: www.laticrete.com/#sle.
   3. Mapei Corporation: www.mapei.com.
   4. Substitutions: See Section 016000 - Product Requirements.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
   2. Products:
      a. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
      b. LATICRETE International, Inc; TRI-LITE: www.laticrete.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/#sle.
   3. Provide a high performance bagged cementitious powder to be mixed with water for thin-set installation. Provide unmodified setting materials as recommended per waterproofing and crack isolation material manufacturer.
   4. Substrate Limitations:
      a. Surfaces must be structurally sound, stable and rigid enough to support tile.
      b. Substrate deflection must not exceed L/360.
   5. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.
   6. Location: Ceramic wall tile locations.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. Custom Building Products: www.custombuildingproducts.com/#sle.
   2. LATICRETE International, Inc: www.laticrete.com/#sle.
   3. Mapei Corporation: www.mapei.com.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Grout material shall be 100% solids epoxy compound for grouting tile as specified.
   2. Grout shall be sag-resistant and have bond strength greater than 1000 psi.
   3. Applications: Provide at all tile unless noted otherwise.
   4. Color: As selected by Architect from manufacturer's full line.
   5. Products:
      a. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
      b. Mapei Corporation; Kerapoxy CQ: www.mapei.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, modified silane polymer, or urethane sealant; moisture- and mildew-resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color: As selected by Architect from manufacturer's full line.
   3. Products:
      a. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
      b. Mapei Corporation; Mapesil T Plus: www.mapei.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch (11 mm) thick; 2-inch (51 mm) wide coated glass fiber tape for joints and corners.

B. Mesh Tape: 2 inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Vacuum clean surfaces and damp clean.

A. Seal substrate surface cracks with filler.

B. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to feather edge.

C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.

B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and base joints.

C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

D. Form internal angles square and external angles bullnosed.

E. Install ceramic accessories rigidly in prepared openings.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.

J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C, using membrane at toilet rooms, kitchens, locker rooms, and _____.

B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
   1. Where mortar bed is indicated on drawings, install in accordance with TCNA (HB) Method W222, one-coat method, with waterproofing membrane.

C. Lay out tile wainscots to next full tile beyond dimensions indicated.

3.05 CLEANING

A. Clean tile and grout surfaces.

3.06 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Resilient base.

B. Installation accessories.

1.03 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 12 by 12 inch (305 by 305 mm) in size illustrating color and pattern for each resilient flooring product specified.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Wall Base: 100 linear feet (31 linear meters) of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Protect roll materials from damage by storing on end.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.

2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

1.08 WARRANTY

A. Manufacturer's Warranty: Manufacturer to provide limited warranty for transition strips. The warranty period shall be a minimum of 5 years after substantial completion

B. Manufacturer's Warranty: Manufacturer to provide warranty for resilient tile flooring. The warranty period shall be a minimum of 6 years after substantial completion.

C. Special Project Warranty: Submit flooring Installer's Warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for the following warranty period.
1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 RESILIENT BASE

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Rubber Flooring:
1. As recommended by flooring manufacturer.

D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that required floor-mounted utilities are in correct location.

3.02 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.03 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.04 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 096700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and information on associated accessories.

C. Samples: Submit two samples, 3 by 5 inch (76 by 127 mm) in size illustrating color and pattern for each floor material for each color specified.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

F. Manufacturer's Qualification Statement.

G. Applicator's Qualification Statement.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Top Coat Materials: 2 gallons (8 liters).

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum 3 years of documented experience.
   2. Approved by manufacturer.

C. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

1.05 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.
   4. Minimum Size: 48 inches by 48 inches (1220 mm by 1220 mm).

C. See Section 014000 - Quality Requirements for additional requirements.

D. Obtain approval of mock-up by Architect before proceeding with work.

E. Approved mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring: Epoxy, with aggregate.
   1. Aggregate: Vinyl flakes.
   2. System Thickness: 79 mils (2 mm), nominal, dry film thickness (DFT).
   3. Texture: Slip resistant.
   4. Sheen: High gloss.
   5. Color: As selected by Architect.
   6. Products:
      a. Dur-A-Flex, Inc.: Dur-A-Chip Flooring System: www.dur-a-flex.com/#sle.
      b. Milamar PM DCS: Decorative Chip Broadcast System:
      c. Sika; Sikafloor DecoDur Flake FX Broadcast Flake System: usa.sika.com.
      d. Stonhard; Stontec ERF: www.stonhard.com/#sle. **BASIS OF DESIGN**.
      e. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

A. Base Caps: Zinc with projecting base of 1/8 inch (3 mm); color as selected.

B. Cant Strips: Molded of flooring resin material.

C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Install access panel recess frames.

B. Install cant strips at base of walls where flooring is to be extended up wall as base.

C. Install terminating cap strip at top of base; attach securely to wall substrate.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Cove at vertical surfaces.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

3.06 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other types of tiles.
   9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   10. Glass.
   11. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin-Williams Company.
   2. Benjamin Moore: www.benjaminmoore.com/#sle.
   3. PPG Paints: www.ppgpaints.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex, High Performance Architectural; MPI #311 or 315.
      a. Products:
         1) Benjamin Moore; Aura, Waterborne Exterior Soft Gloss, Semi-Gloss. (MPI #311)
         2) Pittsburgh Paints Acri-Shield Max Exterior Latex, 649-10 Series, Semi-Gloss. (MPI #311)
         3) Sherwin-Williams; SuperPaint, Exterior Acrylic Latex, Semi-Gloss. (MPI #311). **BASIS OF DESIGN**.
   3. Top Coat Sheen:
      a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
   4. Primer: As recommended by top coat manufacturer for specific substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Masonry:
   1. Prepare surface as recommended by top coat manufacturer.

H. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Prime surfaces to receive wall coverings.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Ceramic and other tiles.
   9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
   10. Glass.
   11. Concrete masonry units in utility, mechanical, and electrical spaces.
   12. Acoustical materials, unless specifically indicated.
   13. Concealed pipes, ducts, and conduits.

1.03 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Shop-primed items.

B. Section 099600 - High-Performance Coatings.

1.04 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.05 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

G. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit two paper chip samples, 12 x 12 inch (304.8 x 304.8 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.
   4. At project closeout, provide the color mixture name and code to the Owner or owner's representative for accurate future color matching.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.08 MOCK-UP

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Provide wall/ceiling assembly illustrating paint color, texture and finish for each condition.

C. Provide door and frame assembly illustrating paint color, texture, and finish.
   1. For each condition.

D. Locate where directed by Architect.

E. Mock-up may remain as part of the work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

E. Disposal:
   1. Never pour leftover coating down any sink or drain. Use up material on the job or seal can and store safely for future use.
   2. Do not incinerate closed containers.
   3. For specific disposal or recycle guidelines, contact the local waste management agency or district. Recycle whenever possible.

1.10 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

1.11 WARRANTY

A. Inspection of all surfaces to be coated must be done by the manufacturer's representative to insure proper preparation prior to application. All thinners, fillers, primers and finish coatings shall be from the same manufacturer to support a product warranty. Products other than those submitted shall be accompanied by a letter stating its fitness for use and compatibility.

B. At project closeout, provide to the Owner or owner's representative an executed copy of the Manufacturer's standard form outlining the terms and conditions of and any exclusions to their Limited Warranty against Manufacturing Defect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Base Manufacturer: Sherwin-Williams.
   2. Benjamin Moore Paints: www.benjaminmoore.com/#sle.
   3. Pittsburgh Paints: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle. **BASIS OF DESIGN**.

C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
4. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, and concrete masonry units.
1. Two top coats and one coat primer.
2. Top Coat(s): Interior Latex; MPI #43, 44, 52, 53, 54, or 114.
   a. Products:
      1) Sherwin-Williams ProMar 200 HP Series, Eg-Shel. (MPI #52)
3. Top Coat Sheen:
   a. Eggshell: MPI gloss level 3; use this sheen for walls and vertical surfaces (as indicated on drawings).
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
2. Two top coats and one coat primer.
3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
   a. Products:
      1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
4. Top Coat Sheen:
   a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

5. Primer: As recommended by top coat manufacturer for specific substrate.

C. Ferrous Metals, Unprimed, Latex, 3 Coat:
1. One coat of latex primer.
2. Semi-gloss: Two coats of latex enamel.

D. Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
2. Semi-gloss: Two coats of latex enamel.

E. Galvanized Metals, Latex, 3 Coat:
1. One coat galvanize primer.
2. Semi-gloss: Two coats of latex enamel.

F. Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of latex primer sealer.
2. Eggshell: Two coats of latex enamel.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.

G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.

H. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

J. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

K. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

B. Owner will provide field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. High performance coatings.

B. Surface preparation.

1.03 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

C. Section 096700 - Fluid-Applied Flooring: High performance fluid-applied flooring systems.

1.04 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.

C. Samples: Submit two samples 8 by 8 inch (203 by 203 mm) in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Coating Materials: 1 gallon (4 liters) of each type and color.
3. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum _____ years documented experience.

1.07 MOCK-UPS

A. See Section 014000 - Quality Requirements for general requirements for mock-ups.

B. Provide mock-up of _____, ____ feet (____ m) long by ____ feet (____ m) wide, illustrating coating , for each specified coating.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F (13 degrees C) or above 90 degrees F (32 degrees C).

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Restrict traffic from area where coating is being applied or is curing.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.

B. Provide high performance coating products from the same manufacturer to the greatest extent possible.

C. High-Performance Coatings:
   1. PPG Paints: www.ppgpaints.com/#sle.
   2. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
   3. Tnemec Company, Inc: www.tnemec.com/#sle. **BASIS OF DESIGN**.
   4. Substitutions: Section 016000 - Product Requirements.

2.02 HIGH-PERFORMANCE COATINGS

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in MPI Approved Products List.

2.03 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.
   1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
   2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
   3. Colors: Selected from manufacturer's standard colors.

B. Urethane Coating for exterior exposed metal :
   1. Number of Coats: Two.
   2. Top Coat(s): Polyurethane, Two-Component; MPI #72, #174.
      a. Sheen: Semi-Gloss.
      b. Products:
         1) Pittsburgh Paints; Pitthane Ultra Polyurethane Enamel, 95-8001 Series, Gloss: www.ppgpaints.com/#sle. (MPI #72)
         2) Sherwin-Williams; Acrolon 218 HS: www.protective.sherwin-williams.com/#sle. (MPI #72, #174)
         3) Tnemec Company, Inc; Series 1095 Endura-Shield: www.tnemec.com/#sle. **BASIS OF DESIGN.**

2.04 PRIMERS

A. Primer: As recommended by coating manufacturer for specific substrate.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent cover materials.

G. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.
   2. Concrete Floors and Traffic Surfaces: 8 percent.

H. Proceed with coating application only after unacceptable conditions have been corrected.
   1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

D. Remove finish hardware, fixture covers, and accessories and store.

E. Existing Painted and Sealed Surfaces:
   1. Remove loose, flaking, and peeling paint. Feather edge and sand smooth edges of chipped paint.
   2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

F. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3, and protect from corrosion until coated.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for general requirements for field inspection.

B. Owner will provide field inspection.

C. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Touch up and restore coated surfaces damaged by testing.

2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, and specified thickness, Contractor shall pay for retesting and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations, and specified thickness.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

D. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

3.07 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 099723
CONCRETE AND MASONRY COATINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Moisture resistant textured concrete and masonry coatings.

1.03 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

1.04 REFERENCE STANDARDS

A. ASTM D522/D522M - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings; 2017 (Reapproved 2021).

B. ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films; 2013 (Reapproved 2021).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials and the inclusion of all associated materials required for a complete system.

C. Samples: Submit two samples 3 by 5 inch (76 by 127 mm) in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.07 MOCK-UP

A. Provide mock-up of finished installation, 10 feet (3 m) long by 10 feet (____ m) wide, illustrating coating, color, and surface sheen, for each specified coating.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not install materials when temperature is below 55 degrees F (13 degrees C) or above 90 degrees F (32 degrees C).

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coatings - General: Provide complete systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated.
   1. Provide manufacturer's recommended primers and accessories as required for a complete. compliant system.

B. Water Based High Build, Fiber Reinforced Textured Coating: Single component acrylic coating, color pigments.
   1. Dry Film Thickness: 12 mils (0.3 mm) minimum, per coat.
   2. Flexibility Test: Passing, when tested according to ASTM D522/D522M with a 1/2 inch (12.7 mm) mandrel.
   3. Water Vapor Permeance Rate: 16.9 perms (966.9 ng/Pa s sq m) when tested according to ASTM D1653, method B.
   4. Color: To be selected by Architect from manufacturer's standard range.
   5. Manufacturers:
      a. Tremco Commercial Sealants and Waterproofing; TREMGard HB: www.tremcosealants.com/#sle.
      b. PPG Architectural Coatings; Perma-Crete 4-110XIC Series: www.pittsburghpaintsco.com/#sle .
      c. Sherwin Williams; Conflex XL Smooth High Build Acrylic Coating: www.sherwin-williams.com/#sle. **BASIS OF DESIGN**.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Concrete and Masonry: Prior to priming, patch holes and indentations and fill cracks with manufacturer's recommended crack repair material.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Room and door signs.

B. Emergency evacuation maps.

1.03 RELATED REQUIREMENTS

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. General: The submittal package shall be submitted as a complete package, including the following listed below. Individual submittals will be returned unaccepted until the complete package is submitted.

C. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

D. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, type styles, graphic elements[, including tactile characters and Braille, and layout for each sign.

E. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

F. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

G. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

H. Verification Samples: Submit samples showing colors specified.

I. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

J. Manufacturer's Qualification Statement.

K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: An employer of workers trained and approved by manufacturer.

C. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

D. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.09 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

D. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

E. Coordinate placement of anchorage devices with templates for installing signs.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Deterioration of metal and polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
1. Inpro: www.inprocorp.com/#sle.
2. ASI-Modulex, Inc.
3. Venus Series.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
      a. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
   3. Character Height: 1 inch (25 mm).
   4. Sign Height: 3 inches (75 mm), unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.
      a. And at every required means of egress access.
   2. Map content to be provided by Owner.
   3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

D. Schedule/Locations: Locate all signage as indicated on the drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, non-glare on front.
      a. Furnish insert material and software for creating text and symbols for PC-Windows for Owner production of paper inserts.
      b. Furnish insert material cut-to-size for changeable message insert.
   4. Wall Mounting of One-Sided Signs: Tape adhesive.
      a. As recommended by signage manufacturer.
   5. Wall mounted with Hilti-Toggler for sizes 12 by 12 inch (304.8 by 304.8 mm) or larger.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: Clear.
   4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/8 inch (3 mm).

2.05 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

C. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors for all sizes greater than 12 by 12 inches (304.8 by 304.8 mm). Furnish inserts, as required, to be set into concrete or masonry work.

2.06 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated. Comply with requirements indicated for material, thicknesses, finishes, colors, designs, shapes, sizes and details of construction.
   1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
   2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
   3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
   4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
   5. Form panels to required size and shape.
   6. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

2.07 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.08 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.
   1. Location: Panel Signs as indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
   1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

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

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Locate signs and accessories where indicated on drawings and as scheduled.
   1. Sign surfaces shall be free of distortion and other defects in appearance.
   2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls (or non-active door leaf). Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

E. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
   1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
   2. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
   3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.
   4. Signs larger than 12 by 12 inch (304.8 by 304.8 mm) are to be mounted using Hilti - Togglers as recommended by manufacturer for size and weight of sign.

F. Cleaning and protection:
   1. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible from a distance of 5 feet.
   2. Remove temporary coverings and protection to adjacent work areas.
   3. After installation, clean soiled sign surfaces according to manufacturer's written instructions.

G. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 102113.13
METAL TOILET COMPARTMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Metal toilet compartments.

B. Urinal screens.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.04 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 6 x 6 inch (152 x 152 mm) in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Toilet Compartments:
   1. ASI Accurate Partitions; Stainless Steel: www.asi-accuratepartitions.com/#sle.
   2. ASI Global Partitions; Stainless Steel: www.asi-globalpartitions.com/#sle.
   3. General Partitions Mfg. Corp; Stainless Steel: www.generalpartitions.com/#sle.
   4. Hadrian; Hadrian - Standard Series - Stainless: www.hadrian-inc.com/#sle.
   5. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

2.03 COMPONENTS

A. Toilet Compartments: Stainless steel, floor-mounted headrail-braced.

B. Doors, Panels, and Pilasters: Sheet steel faces, pressure bonded to sound-deadening core, corners made with corner clips or mitered, welded, and ground smooth.
   1. Panel Faces: 22 gauge, 0.0299 inch (0.76 mm).
   2. Door Faces: 22 gauge, 0.0299 inch (0.76 mm).
   3. Pilaster Faces: 20 gauge, 0.0359 inch (0.91 mm).
   4. Reinforcement: 12 gauge, 0.1046 inch (2.66 mm).
   5. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.

C. Door and Panel Dimensions:
   1. Thickness: 1 inch (25 mm).
   2. Door Width: 24 inches (610 mm).
   3. Door Width for Handicapped Use: 36 inch (915 mm) , out-swinging.
   4. Height: 63-1/2 inches (1613 mm).

D. Pilasters: 1-1/4 inch (32 mm) thick, of sizes required to suit compartment width and spacing.

E. Urinal Screens: Wall mounted with continuous panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

2.04 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No.4 finish, 3 inches (175 mm) high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow stainless steel tube, 1 by 1-5/8 inches (25 by 41 mm) in size, with anti-grip strips and cast socket wall brackets.

C. Brackets: Polished stainless steel.

D. Attachments, Screws, and Bolts: Stainless steel, tamper-proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Nylon bearings.
   3. Thumb turn or sliding door latch with exterior emergency access feature.
   4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   5. Coat hook with rubber bumper; one per compartment, mounted on door.
   6. Provide door pull for outswinging doors.

2.05 FINISHING

A. Stainless Steel Compartments: No. 4 finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that field measurements are as indicated on shop drawings.

C. Verify correct spacing of and between plumbing fixtures.

D. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch (9 to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

1.03 RELATED REQUIREMENTS

A. Section 093000 - Tiling: Ceramic washroom accessories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2023.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

H. ASTM C1036 - Standard Specification for Flat Glass; 2021.

I. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

J. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
   1. For each type of product indicated. Include the following:
      a. Construction details and dimensions.
      b. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
      c. Material and finish descriptions.

d. Features that will be included for Project.
e. Manufacturer's warranty.
1) Warranty: Sample of special warranty.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

D. Manufacturer's operation, care and cleaning instructions.

E. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

F. Furnish indicated spare parts that are packaged with identifying labels listing associated products.

1.07 QUALITY ASSURANCE

A. Source Limitations: Obtain products from single source from single manufacturer as listed in Part 2, Washroom Accessories.

B. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of 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.

1.08 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.09 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Bobrick Washroom Equipment, Inc: www.bobrick.com. **BASIS OF DESIGN**.
3. Bradley Corporation: www.bradleycorp.com/#sle.

B. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide three keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Zinc Alloy: Die cast, ASTM B86.

G. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

H. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

I. Adhesive: Two component epoxy type, waterproof.

J. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

K. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

F. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

G. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
   1. Products:
      a. Bobrick Washroom Equipment, Inc.; B-2888, Surface-Mounted Multi-Roll Toilet Tissue Dispenser, Satin Finish, Two Rolls: www.bobrick.com/#sle.
   2. Drawing Tag: TPH.

B. Combination Towel Dispenser/Waste Receptacle: Recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
   1. Waste receptacle liner: Reusable, heavy-duty vinyl.
   2. Towel dispenser capacity: 400 C-fold.
   3. Waste receptacle capacity: 6 gallons (23 liters).
   4. Products:
      a. Bobrick Washroom Equipment, Inc.; B-3940, Classic Series Recessed Convertible Paper Towel Dispenser and Waste Receptacle: www.bobrick.com.
   5. Drawing Tag: PTD/WR.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with satin finish cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator.
   1. Minimum Capacity: 40 ounces (1.18 liters).
   2. Products:

a. Bobrick Washroom Equipment, Inc.; 818615, ConturaSeries Surface-Mounted Soap Dispenser for Antibacterial Soaps, Satin Finish: www.bobrick.com/sle.

3. Drawing Tag: LSD.

D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
4. Products:
a. Bobrick Washroom Equipment, Inc.; B-165 1824, Mirror with Stainless Steel Angle Frame: www.bobrick.com.
5. Size: 18-inch wide by 36-inch high.
6. Drawing Tag: MIR.

E. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
1) When tested according to ASTM F 446.
b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, concealed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Products:
1) Bobrick Washroom Equipment, Inc.; B-5806, 1-1/4" (32 mm) Diameter Stainless Steel Grab Bars with Snap Flange: www.bobrick.com.
f. Length(s):
1) GB-1: 36-inch (914.4 mm).
2) GB-2: 48-inch (1219.2 mm).
g. Drawing Tag(s): GB-1, and GB-2.

F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. Bobrick Washroom Equipment, Inc.; B-270, ConturaSeries Surface-Mounted Sanitary Napkin Disposal: www.bobrick.com.
2. Drawing Tag: SNDC.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Color: White.
4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
5. Products:
a. IPS Corporation; Lav Guard 2 Undersink Piping Covers: www.ipsplumbingproducts.com/#sle.

b. Plumberex Specialty Products, Inc; Plumberex Pro-Extreme: www.plumberex.com/#sle.
c. Truebro, Inc.; Handi Lav-Guard , Ellington, Connecticut; (203) 875-2868.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
   1. Using fasteners appropriate to substrate indicated and recommended by unit manufacturer.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 ADJUSTING AND CLEANING

A. Test each piece of equipment provided with moving parts to assure proper operation, freedom of movement, and alignment. Install new batteries in battery-powered items.

B. Repair or replace malfunctioning equipment, or equipment with parts that bind or are misaligned.

C. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

D. Remove temporary labels and protective coatings.

E. Clean and polish exposed surfaces according to manufacturer's written recommendations.

F. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

3.05 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.03 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking.

1.04 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.
   1. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

C. Samples: Submit samples for verification purposes of each type of metal finish required, prepared on metal samples of same thickness and alloy indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

D. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

E. Manufacturer's Instructions: Indicate special criteria and wall opening coordination requirements.

F. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.06 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Standard for Portable Fire Extinguishers”.

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain fire extinguishers and cabinets from one source from a single manufacturer.

D. ADAAG Compliance: Comply with ADAAG on maximum cabinet projection of 4" in corridors where necessary.

1.07 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
   2. Larsens Manufacturing Company/Morris Group International; MP SerMulti-Purpose Dry Chemical Extinguisher: www.larsensmfg.com. **BASIS OF DESIGN**.
   3. Potter-Roemer: www.potterroemer.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
   2. Larsen's Manufacturing Co; Architectural Series: www.larsensmfg.com/#sle. **BASIS OF DESIGN**.
   3. Potter-Roemer: www.potterroemer.com/#sle.

2.02 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Stored Pressure Operated: Deep drawn.
   2. Class: A:B:C.
   3. Size: 5 pound (2.27 kg).
   4. Finish: Baked polyester powder coat, color as selected.
      a. By Architect from manufacturer's full range.
   5. Temperature Range: Minus 65 to 120 degrees F (Minus 54 to 49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire-resistance rating of walls where cabinet installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 20-gauge, 0.036-inch (0.9 mm) thick base metal.

C. Fire Rated Cabinet Construction: Rating to be as indicated on Drawings.
   1. Steel; double wall or outer and inner boxes with 5/8-inch (16 mm) thick fire barrier material.

D. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.

E. Door: 20-gauge, 0.036-inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180-degree opening with two butt hinges.

F. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
   1. By Architect from manufacturer's full range.

J. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Cabinet Signage: "FIRE EXTINGUISHER".

B. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

A. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

B. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install items in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

C. Install cabinets plumb and level in wall openings as indicated on Drawings.

D. Secure rigidly in place.

E. Place extinguishers and accessories in cabinets.

3.03 COMPLETION

A. Extinguishers: Keep extinguishers in locked storage until just prior to inspection for acceptance; obtain signed receipt from Owner's representative and place extinguishers in designated locations, unless instructed to maintain in storage.
   1. Verify that certification tags are attached to each extinguisher.
   2. Replace or recharge, and recertify, extinguishers that were discharged during construction period, either accidentally or in an emergency.

B. Cabinets: All cabinets shall be properly located and rigidly secured, plumb and level. Clean exposed surfaces inside and outside. Remove and replace items, which are damaged and defective and which cannot be acceptably repaired.

C. Other Work: Clean and repair other surfaces damaged, soiled or marred by work of this Section; remove and replace items which cannot be acceptably cleaned or repaired.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

3.05 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Provide a separate maintenance contract for the service and maintenance of fire extinguishers for 12 months from Date of Substantial Completion.

END OF SECTION

SECTION 115313
LABORATORY FUME HOODS AND RELATED PRODUCTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 REFERENCE STANDARDS

A. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

D. ISO 9001 - Quality Management Systems — Requirements; 2015.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2021, with Amendment.

F. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. SEFA 1 - Laboratory Fume Hoods; 2010.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

J. UL 1805 - Standard for Safety Laboratory Fume Hoods and Cabinets; Current Edition, Including All Revisions.

K. UL 61010-1 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements; Current Edition, Including All Revisions.

1.03 SUMMARY

A. Section Includes:
   1. Bench-top High-Performance Laboratory Fume Hoods.
   2. Service fixtures (ie. water, gas, etc.) and electrical service fittings in fume hoods.
   3. Piping and wiring within service fittings, light fixtures, switches, and other electrical devices.
   4. 4.Fume hood base support.
   5. Work Surfaces within fume hoods.
   6. Laboratory sinks and cup sinks in fume hoods.
   7. Filler panels and ceiling enclosures for fume hoods.

B. Related Sections:
   1. Section: Furnish and installation of plumbing utilities and final connections to fume hoods.
   2. Section: Furnishing and installation of exhaust duct work and equipment, and final connection of hoods.
   3. Section: Furnishing and installation of electrical utilities and final connections to hoods.

1.04 SCOPE AND CLASSIFICATION

A. This specification covers the requirements for the purchase of bench mounted laboratory fume hoods for use with remote exhaust blower systems.

B. Bench-mounted laboratory fume hoods in 4, 5, 6 and 8-foot widths, internal depth of 23.3" and external depth of 31.7" is required.

C. This specification sets the intent for quality, performance and appearance.

1.05 REFERENCES

A. The laboratory hoods must conform to the following regulations and standards.
   1. SEFA 1, Scientific Equipment and Furniture Association, Recommended Practices for Laboratory Fume Hoods
   2. SEFA 8, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests
   3. NFPA 45, National Fire Protection Association, Fire Protection for Laboratories Using Chemicals
   4. ASTM E84-09C, ANSI 2.5, NFPA 255, UL 723, UBC 8-1 (42-1), Standard Test method for Surface Burning Characteristics of Building Materials
   5. ASHRAE 110, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Method of Testing Performance of Laboratory Fume Hoods
   6. ANSI/AIHA Z9.5, American Industrial Hygiene Association, Laboratory Ventilation
   7. Federal Register 29 CFR Part 1910, Occupational Safety & Health Administration, U.S. Department of Labor, Occupational exposures to hazardous chemicals in laboratories.

B. The laboratory fume hoods must carry the ETL listed mark for the following.
   1. UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use
   2. CAN/CSA C22.2 No. 61010-1, Canadian Standards Association, Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use
   3. UL 1805, Underwriters Laboratories Inc., Standard for Laboratory Hoods and Cabinets

C. 230 volt model fume hoods must carry the CE conformity marking as required by the Council of European Communities.

1.06 PERFORMANCE REQUIREMENTS

A. General Design Requirements (See Part 2 for details)
   1. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, contain and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
   2. 2.Fume hood shall be factory designed to function as a by-pass fume hood.
   3. Structure and Materials of construction
      a. Hoods are of double-wall construction
      b. Powder-coated, cold rolled steel exterior
      c. Galvanized steel support members
      d. One-piece, monolithic, molded polyester resin liner
   4. Baffles
      a. One-piece, monolithic, molded polyester resin
      b. Moving or adjustable baffles are not acceptable
   5. Sash
      a. Maximum opening is 28".
      b. Unobstructed viewing height is 37.5".

c. Hood incorporates a perforated sash handle to bleed air into the hood chamber directing fume concentrations away from the user's breathing zone.

6. Airfoil:
   a. Hoods are provided with an airfoil across the bottom of the sash area that allows airflow into the hood regardless of user's position.
7. Besides the exhaust blower, no additional blowers are required for specified containment.
8. Access for maintenance is from both the front and exterior sides of the hood.
9. Services:
   a. Hood manufacturer shall furnish and deliver all service outlets, accessory fittings, electrical receptacles and switches, as listed in these specifications, equipment schedules or as shown on drawings.
   b. b.Plumbing fittings mounted on the fume hood superstructures shall be pre-plumbed per section 2.03.
   c. Final plumbing and electrical connections are the responsibility of those contractors fulfilling requirements of Divisions 22, 23, and 26.
   d. All electrical services are pre-wired to a single point internal junction box at the top right of the hood.
10. Hoods without service fixtures must pass through a 33" opening without disassembly.

B. Containment
   1. The purpose of this section is to set a standard of performance for the bidder's laboratory fume hood before award of contract, and may not necessarily represent the operating conditions of the hoods after installation. Before or after award of contract, owner may require representative witness to said testing at their option, with failure to meet passing criteria as grounds for rejection of the bidder. Test data shall be provided at no cost to the owner.
   2. Evaluation of manufacturer's standard product shall take place in manufacturer's test facility meeting the following criteria.
      a. Lab to be located at manufacturer's place of business for the testing of bench-mounted laboratory hoods in accordance with ASHRAE Standard 110.
      b. Room shall accommodate hoods up to 16' wide, while maintaining sufficient area so that a minimum of 15 feet (457.2 cm) of clear space is available in front of and 5' on both sides of hoods for viewing tests.
      c. The facility's ventilation system shall have adequate heating and air conditioning so that room air temperatures can be maintained within the desired ranges.
      d. One hundred percent non-recirculated air to be both carbon and HEPA filtered to ensure removal of contaminants that could interfere with containment testing before entering the lab.
      e. Make-up air to the test room shall be ceiling-supplied through any combination of multiple diffusers to either minimize adverse airflow, or increase it depending on test objectives.
      f. Exhaust volumes shall be computer controlled and measured via AMCA calibrated orifices and flow station at each exhaust trunk.
      g. Room pressurization must be digitally monitored, and variable depending on test objectives.
      h. All equipment must be properly calibrated.
      i. Qualified personnel familiar with the laboratory and its operation shall be available to perform the test.
      j. Include the following instrumentation and test equipment:

1) Properly calibrated hot wire thermal anemometer capable of measuring air velocities from 10 to 600 ft/minute; correlate with computer data acquisition format to provide simultaneous readings at all points.
2) Theatrical smoke generator or other source of high volume smoke.
3) Smoke tubes or other source of localized smoke.
4) Leakmeter with traceable calibration, calibrated just before test, to indicated concentration of sulfur hexafluoride.
5) Tracer gas: Sulfur hexafluoride supplied from a cylinder with two stage regulator.
6) Adjustable mannequin, 5’ 0" to 5’8" in height, with reasonable human proportions, clothed in a smock.
7) Inclined manometer with graduations no greater than 0.2 inch (5.08 mm) of water.
8) Ejector system: Tracer gas ejector built to specific ASHRAE-110 requirements.
9) Critical orifice: Sized to provide tracer gas at four or eight liters per minute at an upstream pressure sufficient to maintain release rate.
10) Data acquisition software to include HoodPro™ and LabMeasurePro™ from Exposure Control Technologies, Inc.

3. Hood shall be tested to ASHRAE 110 modified test method as detailed below.
4. Some fume hoods may use face velocity controls, motorized baffles, integral auxiliary make up, or supply fans. Because all of these devices are subject to failure, containment testing shall show both operational containment and product containment with these systems off.
5. Fume hood sashes shall be placed in their full open position, at least 28" from the work surface, unless noted otherwise.
6. Ambient Temperature: 68 to 74 degrees Fahrenheit (23.33 degrees Celsius)
7. Average Face Velocity: Face velocity average shall be 60 fpm, as noted below in subsection 8.d, parts 1 and 2, plus or minus 5%.
   a. An imaginary grid is formed comprised of equal 12" by 12" squares, or smaller, across the face opening of the laboratory hood. Airflow velocity readings are taken at the intersections of these grids with calibrated hot wire anemometer over a twenty second period of time. Probes shall communicate readings to a computer data acquisition package, which will provide an average of each reading over the one-minute period and also an overall average upon completion of data acquisition. Face velocity shall be determined by averaging readings at the hood face.
   b. Average face velocity must be achieved without exceeding the CFM noted in part C.
8. Tracer Gas Detection: Hood shall achieve a rating of 4.0AM0.00 maximum average and 4.0AM0.01 maximum spike (unless specifically otherwise noted), wherein:
   a. = tracer gas release in liters/minute, AM = as manufactured, 0.01 = tracer gas in parts per million (PPM)
   b. With the ejector body 6" from the rear of the sash plane, the test shall be conducted for each ejector position noted.
      1) Left position with ejector 12" from the left interior wall.
      2) Center position with ejector equidistant from the sidewalls.
      3) Right position with ejector 12" from the right interior wall.
   c. Install mannequin positioned in front of the hood, centered on the ejector.
   d. Detector probes shall be placed 3" in front of the sash plane. The test shall be conducted for each detector probe position and corresponding face velocity.
      1) Detector probe in the region of the nose and mouth of the mannequin. Test with average face velocity of 60 fpm.

2) With the mannequin height reduced 4", place detector probe in the chest of the mannequin, and even with the height of the ejector. Test with average face velocity of 60 fpm.

e. Open tracer gas valve, and collect readings with a computer data acquisition package, which is capable of monitoring and visually recording a minimum of one reading per second for a minimal five minute time period for each position.

f. The single control rating of the fume hood shall be the results of the test position yielding the highest average levels of tracer gas in any of the six mannequin/ejector configurations.

g. With the ejector and mannequin in the center position, detector probe in the region of the nose and mouth of the mannequin, average face velocity of 60 fpm, tracer gas released, and concentration recorded, open and close the sash in a smooth motion. Test to be repeated three times, with peak values of 0.01 PPM or less.

h. With the mannequin removed, the periphery of the hood is traversed by the probe at 1" in front of the hood opening at a rate of 3 inches (76.2 mm) per second. The hood shall have a maximum perimeter reading of 0.03 PPM or less.

9. Flow Visualization:

a. Test the operation of the lower air bypass airflow opening and hood periphery by introducing light smoke under the airfoil, and around the perimeter of the sash opening. If any smoke that enters the hood reverses directions and escapes from any of these locations, the hood fails this portion of the test and receives no rating.

b. Introduce smoke along both walls and the hood floor in a line parallel to the hood face and 6 inches (152.4 mm) back into the hood. Define air movement toward the face of the hood as reverse airflow and define lack of movement as dead air space. All smoke should be carried to the back of the hood and out.

c. Introduce a large volume of smoke at the work surface in the center of the hood, and 6" inside the plane of the sash. Define air movement toward the face of the hood as reverse airflow and define lack of movement as dead air space. All smoke should be carried to the back of the hood and out.

d. All data on the above, including instrumentation and equipment, and test conditions shall be provided on a report, including the average face velocities, and a separate graph-type performance curve on all tracer gas tests for all required fume hood widths. Performance test data for a 6’ representative hood shall be conducted by an independent testing agency and by a specific individual certified to perform such tests by the National Environmental Balancing Bureau (NEBB).

C. Efficiencies

1. The fume hood shall maintain constant volumetric rate (+/- 5 CFM) and static pressure losses (+/- 0.01" H2O) across all sash positions, unless the hood has a restricted by-pass for use with a variable air volume (VAV) system.

2. The fume hood shall demonstrate a minimization of the volumetric rate of air (CFM) requirement at any given face velocity. Required CFM to achieve desired face velocity shall not exceed that which is noted in the chart below.

3. The fume hood shall demonstrate a minimization of static pressure loss (inches of H2O) at any given CFM. Static pressure loss at desired face velocity, and corresponding CFM, shall not exceed that which is noted in the chart below.

a. *There is not a written standard that would suggest a design face velocity below 60 fpm. This data is for informational purposes only.

Airflow Volumetric Rate (CFM) @ Static Pressure (inches of water)

VELOCITY (fpm) Sash at 28" Open	4' Hood	5' Hood	6' Hood	8' Hood
100	725, 0.22"	955, 0.31"	1180, 0.41"	1640, 0.28"
80	580, 0.14"	765, 0.20"	945, 0.26"	1310, 0.18"
60	435, 0.08"	575, 0.11"	710, 0.15"	985, 0.10"
50*	365, 0.06"	480, 0.08"	590, 0.10"	820, 0.07"

VELOCITY (fpm) Sash at 28" Open	4' Hood	5' Hood	6' Hood	8' Hood
100	450, 0.09"	595, 0.12"	735, 0.16"	1025, 0.11"
80	365, 0.06"	480, 0.08"	590, 0.10"	820, 0.07"
60	270, 0.03"	360, 0.04"	440, 0.06"	615, 0.04"

D. Noise Criterion: The hood shall have a Noise Criterion (NC) rating of less than 50; measured 36" in front of the hood with full open sash, at 100 fpm face velocity. NC is a factor of sound pressure level (dB) and frequency.

E. Illumination: Shall be a minimum average of 80 foot (2438.4 cm)-candles inside the work area. Work area is defined as the area inside the lined portion of the fume hood, from the face of baffle to sash plane, from interior left to interior right, and from the work surface to a height of 28 inches (711.2 mm).

F. Materials of Construction: Interior and Exterior materials of construction and finishes shall meet the requirements in Part 2 of this specification.

1.07 QUALITY ASSURANCE

A. Fume hoods shall be designed, including comprehensive engineering analysis, by a qualified, licensed Professional Engineer.

B. Manufacturer’s Qualifications
   1. ISO 9001 Certified manufacturing plant and processes.
   2. Ten installations of equal or larger size and requirements. Provide contact at each.
   3. Only hood manufacturers who have had fume hoods as a principal product for 30 years are considered.

C. Fume hoods shall be Made in America
   1. 95% or more of raw material and component suppliers shall be United States based.
   2. Stainless and cold rolled steel used in manufacturing shall be sourced from United States steel mills.
   3. Final product must be fabricated and assembled within the United States of America.
   4. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

D. Supply all equipment in accordance with this specification. Offering a product differing in materials, construction, or performance from this specification requires written approval obtained seven days or more before the proposal deadline.

E. The owner/architect reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

F. Manufacturer's warranty against defects in material or workmanship on its fume hoods will be for 1 year from date of installation or 2 years from date of purchase, whichever is sooner, and includes replacement of parts (except lamps) and labor.

1.08 SUBMITTALS

A. Action Submittals
   1. Laboratory hood specification sheets and product manuals shall be submitted by the hood manufacturer upon request, and include safe and proper operation and maintenance information.
   2. Shop Drawings: Include plans, elevations, sections, and details.
      a. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
      b. Indicate locations and types of service fittings together with associated service supply connection required.
      c. Indicate duct connections, electrical connections, and locations of access panels.
      d. Include roughing-in information for mechanical, plumbing, and electrical connections.
      e. Provide face opening, volumetric rates, and static pressure drop data.
   3. Submit a document detailing the information supplied on the Hood Safety Practices Label to verify compliance to specifications.

B. Informational Submittals
   1. Product Test Reports: Showing compliance with specified performance requirements, including NEBB representative test report as defined previously.
   2. Independent validation:
      a. Written verification that the laboratory fume hoods carry the ETL listed mark for UL 61010-1, CAN/CSA C22.2 No. 61010-1, and UL 1805.
      b. b. Written verification that 230 volt model fume hoods carry the CE conformity marking as required by the Council of European Communities.
      c. Written verification from an outside testing agency confirming coating compliance to SEFA 8-2010, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests.
   3. Documentation of ISO 9001 Certified manufacturing plant and processes.
   4. List of five installations (of equal or larger size and requirements) is available upon request. Provide contact at each.
   5. Declaration of Made in America. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

C. Material Submittals
   1. Samples for Verification: of the hood exterior wall material, interior liner and baffle material, epoxy work surface material, and color selection chips are available from the hood manufacturer upon request.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Labconco Corporation, 8811 Prospect Avenue, Kansas City, Missouri 64132. Basis-of-Design Product: Protector Premier; for use with remote blower: www.labconco.com/#sle.
   2. Kewaunee Scientific Corporation, 2700 West Front Street, Statesville, North Carolina 28677. Product: Supreme Air: www.kewaunee.com/#sle.
   3. Hamilton Scientific (Thermo Fisher Scientific), 1316 18th Street, Two Rivers, Wisconsin 54241. Product: Concept: www.thernofisher.com/#sle.

2.02 MATERIALS

A. Hood Interior Liner and Baffle
   1. 1. Liner material must comply with UL 1805, and be listed within NRTL test report as proof of compliance.
   2. General Material Properties
      a. Nonflammable, corrosion and chemical-resistant
      b. Fiberglass reinforced polyester resin
      c. Minimum thickness is 3/16"
      d. Smooth, white finish
   3. Method of Construction
      a. Liner shall be one continuous molded component, and of monolithic construction, including the left and right side walls, rear, ceiling, and duct collar. Liners that are bonded together, do not include the duct collar within the continuous structure, or are of panelized construction are not acceptable.
   4. Flame and Smoke Characteristics
      a. Flame retardant, self-extinguishing, with a flame spread rating of 25 or less in accordance with ASTM E84
   5. Chemical Resistance
      a. Splash and Spill Resistance:
         1) Suspend sample panel in a vertical plane
         2) Apply five drops of each reagent listed with an eyedropper
         3) Apply liquid reagents at top of panel and allow to flow down full panel height
      b. Fume Resistance:
         1) Place 25 milliliters of reagent into 100 milliliters beakers and position panel over beaker tops in the proper sequence. Ensure beaker pouring lip permits air to enter the interior atmosphere.
         2) After 24 hours remove panel, flush with water, clean with detergent, rinse, wipe dry and evaluate
      c. Evaluation ratings: Change in surface finish and function shall be described by the following ratings
         1) E: Excellent for intended service with expected long and economic life.
         2) G: Some staining may result with prolonged usage. Satisfactory for limited service. Tests under actual conditions suggested.
         3) F: Surface deterioration may be experienced with prolonged usage. Test under actual conditions.
         4) NR: Not Recommended
      d. Required minimum results for each reagent are available from the hood manufacturer upon request and shall comply with the ratings established in manufacturer’s

standard chemical resistance chart for fiberglass reinforced polyester resin liner material.

B. Sheet Steel
   1. Side panels and access panels 20-gauge (or heavier) sheet steel.
   2. Hood corner posts are 18-gauge sheet steel.
   3. Ceiling enclosure panels are 18 gauge sheet steel.
   4. Cold-rolled, commercial steel (CS) sheet, complying with ASTM A1008/A1008M.

C. Chemical Resistant Finish
   1. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling.
   2. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Third party validation required.
   3. Powder-coat process required. Paint processes that release Volatile Organic Compounds (VOC) are not acceptable.
   4. Color for Fume Hood Finish: As selected by architect from manufacturer's full range.

D. Safety Glass
   1. Tempered
      a. Clarity and temper test to be as specified in latest edition of Glass Tempering Association, Engineering Standards Manual, Section 8.1.
      b. Surface and interior visible quality to be as specified per ASTM C1036, Standard Specification for Flat Glass, Table 4, Quality level Q3.

2.03 CONSTRUCTION

A. Superstructure:
   1. Self-supporting, rigid structural assembly, to support inner wall consisting of fume hood liner and outer wall of sheet metal exterior.
   2. Fabricated from galvanized steel.
   3. Space shall accommodate fume hood wiring and plumbing components for service fixtures.
   4. Access to fixture valves concealed in wall provided by exterior removable access panels or through removable access panels on the front posts.

B. Exterior
   1. Fabricate from steel sheet with component parts screwed together.
   2. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
   3. Interchangeable side panels shall lift off without the use of tools to allow access to plumbing lines, service fittings, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and Velcro type fasteners, are not acceptable.
   4. Corner posts
      a. Pre-punched and plugged to accommodate up to 4 service fixtures per side
      b. All services are accessible from the front of the hood.
      c. Aerodynamic shape
      d. Accommodate two electrical duplexes per side.
      e. Right hand corner post includes electrical switches and pre-cut for Airflow monitor installation.
      f. Un-used penetrations shall be plugged.
   5. Top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.

6. Panel above header shall be removable without the use of tools to allow access to mechanical connection, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and “hook-and-loop” type fasteners, are not acceptable.

C. Dimensions
   1. Overall exterior dimensions are as follows:
      a. 4 foot (121.92 cm) nominal width: 48" w x 59" h x 31.7"d
      b. 5 foot (152.4 cm) nominal width: 60" w x 59" h x 31.7"d
      c. 6 foot (182.88 cm) nominal width: 72" w x 59" h x 31.7"d
      d. 8 foot (243.84 cm) nominal width: 96" w x 59" h x 31.7"d
   2. Overall interior dimensions are as follows:
      a. 4 foot (121.92 cm) nominal width: 38.1" w x 48" h x 23.3"d
      b. 5 foot (152.4 cm) nominal width: 50.1" w x 48" h x 23.3"d
      c. 6 foot (182.88 cm) nominal width: 62.1" w x 48" h x 23.3"d
      d. 8 foot (243.84 cm) nominal width: 86.1" w x 48" h x 23.3"d

D. Hood Liner
   1. Adhere interior liner components to superstructure.
   2. Stainless steel fasteners shall be used on the interior ceiling for structural integrity.
   3. Fasteners exposed to chemical environment are not acceptable.
   4. Punch fume hood lining side panels to receive four service fittings, for use with remote controls, per side. Provide removable plug buttons for holes not used for indicated fittings.

E. Hood Baffle
   1. Baffle system shall be designed to capture a wide range of gaseous densities without adjustment or moving components.
   2. Shall provide a continuous horizontal slot at the work surface, vertical openings running the interior height of the hood on the left and right sides, and an opening at the ceiling running left to right.
   3. The baffle system shall be constructed with the same material as the fume hood liner.
   4. The baffles shall be removable for cleaning.
   5. Exposed components to be non-metallic. Metal components exposed to chemical environment are not acceptable.
   6. Moving parts or adjustment of any kind is not acceptable.

F. Exhaust Connection
   1. Fiberglass reinforced polyester resin, and a continuous component of the fume hood liner. Duct collars attached with fasteners, adhesive, or varying in material of construction from the liner are not acceptable.
   2. 12" ID to accommodate any 12" nominal duct without the need for a transition adapter. 4, 5, and 6-foot hoods have one exhaust connection, 8-foot hoods have two exhaust connections. Additional components required to accommodate 12" nominal mechanical system are not acceptable.
   3. Ducting shall go inside the duct collar to ensure condensate travels into the hood and evaporates. Duct collars that allow duct connection over the collar are not acceptable.

G. Airfoil
   1. Cold Rolled Steel with Chemical-Resistant Finish.
   2. Airfoil shall have an aerodynamic radius to sweep the air into the hood with minimal turbulence. Airfoil directs airflow across work top to remove heavier-than-air gases.
   3. Must have 5 rows of perforations to allow the air to bypass underneath and through the foil and sweep across the work surface to prevent any back flow of fumes escaping from the

front of the hood opening. This airflow continues even if blocked by the presence of the operator.

4. Foil must extend back under the sash to prevent closure of the lower by-pass opening when the sash is in the fully closed position, directly on top of the airfoil.

H. Sash Assembly
1. Glass: Fully tempered safety glass with unobstructed, side-to-side view of fume hood interior and service fixture connections.
2. Dimensions: The full sash opening height is 28", the total unobstructed viewing height is 37.5" measured from the work surface.
3. Sash Tracks: Steel with Chemical Resistant Finish. Shall include bump stops for opening and closing.
4. Sash Handle: extruded aluminum with Chemical Resistant Finish. Sash handle includes a perforated air passage directly atop the handle to bleed air into the hood chamber and direct chemical fumes away from the user's breathing zone. The handle is ergonomic in design and is easy to grasp when operating.
5. Sash guides: Corrosion resistant extruded poly-vinyl chloride.
6. Vertical Sash (Cable and Pulley)
   a. Hoods have a single vertical sash counterbalanced by a single weight.
   b. Sash and weight to be connected via aircraft cable meeting MIL-W-83420 Military Specification.
   c. Rear pulleys shall be connected via timing shaft to prevent sash tilting and permit one finger operation at any point along full width sash handle. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel.
   d. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure.
   e. Include a defeatable, and automatically resetting sash stop positioned for an 18" sash height.

I. Electrical Components
1. Lighting
   a. Provide UL Listed, high-efficiency, quick-start, T8 LED lighting systems, including bulbs.
      1) 4 Foot Hoods - 2 each, 12-watt LED lamps
      2) 5 Foot Hoods - 2 each, 15-watt LED lamps
      3) 6 Foot Hoods - 2 each, 15-watt LED lamps
      4) 8 Foot Hoods - 4 each, 12-watt LED lamps
   b. Vapor-Proof: all electrical components shall be outside of the contaminated air space. Lighting shall be located behind a laminated safety glass shield, sealed to the top of the hood liner.
   c. The LED light assemblies shall be serviceable from outside the fume hood cavity, without the use of tools.
   d. Light switch to be included on the lower right corner post, at heights compliant with the Americans with Disabilities Act (ADA).
2. Blower Switch: Hoods shall be provided without a blower switch, as they will share a single mechanical system with other hoods.
3. Electrical Receptacles
   a. The hoods shall accommodate up to four (two per corner post) electrical receptacles as indicated in schedule or drawings. Options to include:
      1) 115 volt, 60 Hz, three-wire polarized and grounded electrical duplex

2) 115 volt, 60 Hz, three-wire polarized and grounded electrical duplex, with Ground Fault Circuit Interruption (GFCI)
3) 230 volt, 60 Hz, three-wire polarized and grounded electrical duplex

b. Receptacles shall be individually wired to field wiring box, and each rated at 20 Amperes.
c. Cover plates shall be acid resistant thermoplastic.

4. Wiring
   a. Every electrical component shall be individually wired to a single point internal field wiring box (including individual duplexes/receptacles).
   b. Field wiring box to be 7" x 4" x 2.5", grounded, and have (12) 7/8" diameter knock out penetrations.
   c. Final wiring and circuit dedication is to be by others.
   d. Each receptacle circuit shall accommodate being wired to a dedicated building circuit rated at 20A, or the receptacles wired to a single circuit with the total load not exceeding 20 Amperes.
5. Fume hood to have third party validation of compliance to UL 1805 and UL 61010-1 by a Nationally Recognized Testing Laboratory (NRTL).

J. By-Pass Opening
1. The size of the by-pass opening is controlled by sash position for use with a constant volume mechanical system. The hood shall not have a change in static pressure or exhaust volume across all sash positions.

K. Corrosion resistant plate attached to the corner post of the fume hood with the following Hood Safety Practices:
1. For use with substances that produce hazardous levels of airborne chemicals: gas, fumes, vapors, dust
2. Do not put your head in the hood.
3. Minimize drafts and sudden movements in front of the hood.
4. Work a minimum of six inches inside the hood.
5. Elevate equipment above the work surface.
6. Keep sill and baffle unobstructed.
7. Do not use the hood for storage.
8. Adjust the sash to smallest opening possible when in use.
9. Close sash when unattended.
10. Do not remove any of the hood components.
11. Do not place flammable solvents near heat, flame or sparks.
12. Do not evaporate large amounts of flammable liquids.
13. Wipe up spills immediately.
14. Routinely validate airflow.
15. If the ventilation system malfunctions, or airflow alarm indicates unsafe condition, close sash and discontinue hood operation immediately—call for help.
16. Do not use with Biohazards or Perchloric Acid

L. Fume Hood Accessories
1. Service Fixtures: Color-coded hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color-coded index handles
   a. The hoods are equipped without service fixtures or will be provided with a total of up to 8 service fixtures as indicated in schedule.
   b. Hose connectors located inside the fume hood cavity are chemically-resistant, glass-filled polypropylene with 6 serrations.

c. Service lines shall be factory installed from valve to outlet
    1) Copper tubing unless otherwise noted
    2) Brass service lines for gas
    3) Stainless steel service lines for Deionized Water
    4) Connections shall be made with quick-connect compression fittings on the inlet and outlet of the valve body, soldered and brazed connections not easily disassembled are not acceptable.
    5) Services include a coil of tubing to be routed below the hood at time of installation.
d. Valves
    1) Extruded brass valve and rotating seat, TFE-coated silicone bronze stem and TFE packing.
    2) Fixture handles are plastic and color coded as well as labeled for the designated type of service.
    3) Fixtures are rated at maximum pressure of 200 psi (1378.95 kPa).
    4) Coefficient of flow for the valve, Cv=0.43.
    5) Valves are front loaded, located on the fume hood corner post for remote use, and include:
        (a) Hot and cold tap water
        (b) Natural gas
        (c) Air
        (d) Vacuum
        (e) Nitrogen
        (f) Argon
        (g) Steam
        (h) Oxygen (include oxygen compatible lubricant)
        (i) Deionized/Distilled water (Nickel plated and stainless steel components)

2. Tissue Screen: Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
3. Rear Finish Panel: Shall be the same materials and coating as the hood exterior.
4. Ceiling Enclosure Panels:
    a. Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.
    b. Exposed fasteners are not acceptable.
    c. Height adjustment to be within the following ranges as specified in the schedule.
        1) 14.0"
        2) 18.6"
        3) 24.4"
5. Distillation Grid: Include stainless steel rods and connectors for field installation, and factory drilled liner.
6. Fire Suppression System: An ABC dry powder fire suppression system, with 165 degree Fahrenheit fusible link, shall be factory supplied and prepped, and field installed through the ceiling of the fume hood.
7. Digital Airflow Monitor
    a. Provide audible and visual alarm in the event of an unsafe face velocity.
    b. Alarm must sit flush with the fume hood corner post.
    c. Based on a thermally compensated thermistor in the alarm module, and air passing through a separate airstream into the hood interior.

d. Velocity shall be displayed digitally on the user facing LCD in fpm or m/s.
e. LED lights display red for alarm, yellow for caution, and green for normal operation.
f. Must include external alarm and night setback functions.
g. Alarm mute shall be accessible from the front of the monitor; visual alarm must remain activated until alarm condition is corrected.
h. UL Listed electrical components.
i. Calibration shall be through a menu driven step by step procedure.
j. Calibration is the responsibility of the owner, following a complete balancing of the mechanical system, and concurrently with As-Installed testing.

M. Work Surface
1. 1-1/4" thick, molded from solid modified epoxy resin, with smooth, non-specular, black finish.
2. One inch radius front edge for optimal fume hood performance.
3. 3/8" dished area to match the fume hood interior work space and form a water tight pan for spill containment.
4. Include a 2.5" diameter hole on each side for service pass-through and piping. Hole to be covered by hood superstructure upon installation.
5. Include two 1.5" diameter penetrations to accommodate base cabinet venting. Holes to be located outside of dished area and under the fume hood baffles. Include plugs.
6. Physical Properties:
   a. Flexural Strength: Not less than 10,000 psi (68947.60 kPa).
   b. Modulus of Elasticity: Not less than 2,000,000 psi (0.00 kPa).
   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 degrees Fahrenheit (126.67 degrees Celsius).
   f. Flame-Spread Index: 25 or less per ASTM E84.
7. Cupsink
   a. 3 x 6" dimension, polypropylene construction
   b. Provide with strainers and tailpieces, NPS 1-1/2 (DN 40)
   c. To sit flush with dished area of work surface
   d. Cupsink(s) to be located as follows:
      1) Right rear
      2) Right side

N. Supporting Base Cabinets
1. Base cabinets shall be in depths of 22", widths, quantities, and types called out in the equipment schedule and drawings, and meet the requirements of this specification.
2. Construction requirements for all cabinets
   a. Exterior construction is 18 gauge (or heavier) cold rolled sheet steel with Chemical Resistant Finish.
   b. Hinges are 10 gauge (or heavier) plate with self-clinching pilot pin. Knuckle, bullet, or piano type hinges are not accepted.
   c. The rear panel will feature a 12" x 8" removable plumbing access panel.
   d. Units 24" wide or less have only one door.
   e. Each cabinet includes four leveling feet.
   f. Capable of supporting up to 800 pounds.
   g. An 8" filler panel is required to increase the cabinet depth to 30".
3. Standard Storage

a. Overall exterior dimensions:
   1) 48" w x 22" d x 35.5"-36.75"
   2) 36" w x 22" d x 35.5"-36.75"
   3) 30" w x 22" d x 35.5"-36.75"
   4) 24" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
   5) 18" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
   6) 12" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
b. Flush pull handles are ABS, low gloss black.

4. Acid Storage
   a. Overall exterior dimensions:
      1) 48" w x 22" d x 35.5"-36.75"
      2) 36" w x 22" d x 35.5"-36.75"
      3) 30" w x 22" d x 35.5"-36.75"
      4) 24" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
      5) 18" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
   b. Completely lined with a polyethylene corrosion resistant liner. The liner is 3/16" thick, with a vacuum formed PVC liner pan at the bottom to contain spills. Each door has a 3/16" sheet polyethylene liner.
   c. The cabinet is labeled: "ACID".
   d. Flush pull handles are ABS, low gloss black.
   e. Each cabinet is vented into the fume hood with a 1-1/2" vent pipe. It should provide a positive airflow directly into the fume hood exhaust system.
   f. Supply an epoxy coated steel shelf with PVC liner pan if indicated in the schedule.
   g. Acid cabinets with louvers are not acceptable.
5. Solvent Storage
   a. Overall exterior dimensions:
      1) 48" w x 22" d x 35.5"-36.75"
      2) 36" w x 22" d x 35.5"-36.75"
      3) 30" w x 22" d x 35.5"-36.75"
      4) 24" w x 22" d x 35.5"-36.75" h or 31.5"-32.75" for ADA cabinet
   b. Solvent storage cabinets are specifically designed for the storage of flammable and combustible liquids.
   c. Solvent Storage Cabinet must be compliant with NFPA 30 “Flammable and Combustible Liquids Code.”
   d. Cabinets 30" wide and greater shall be tested and approved by Factory Mutual to meet Factory Mutual Approval Standard 6050.
   e. The bottoms, top, sides, and doors are fabricated of 18 gauge steel and are all double panel construction with a 1-1/2" air space between panels.
   f. All joints are welded or screwed to provide a rigid enclosure. A 2" deep liquid tight pan that covers the entire bottom of the cabinet is furnished to contain liquid leaks and spills.
   g. A full-depth, 18 gauge steel, adjustable shelf is also provided. Shelves are sealed leak tight.
   h. Two diametrically opposed flame arrestor vents with spark screens are provided in the back of the cabinet, as well as a grounding screw.
   i. The cabinet has an interior finish same as the exterior.
   j. The cabinet is labeled: "FLAMMABLE - KEEP FIRE AWAY".
   k. The right hand door shall have a three point latching device.

l. Door handles include a key lock. Solvent storage handles are locking lever handles with bright chrome finish.
m. If noted on the schedule, self-closing/self-latching models shall be provided with a fusible-link feature to ensure the doors will close if the temperature outside the cabinet exceeds 165 degrees Fahrenheit. The doors are synchronized so that both doors will fully close.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

B. Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of the hood.

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

3.02 INSTALLATION

A. General: Install fume hoods according to shop drawings and manufacturer's written instructions.

B. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework.

C. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

D. Neighboring splash blocks shall not be attached directly to the hood.

E. Install according to standards required by authority having jurisdiction.

F. Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

G. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.03 FIELD QUALITY CONTROL

A. NFPA 45 requires that fume hoods be field tested when installed.

B. Field test installed fume hoods according to ASHRAE 110 to verify compliance with performance requirements.
   1. Adjust fume hoods, hood exhaust fans, building's HVAC system, and make other corrections until tested hoods perform as specified in fume hood schedule.
   2. After making corrections, retest fume hoods that failed to perform as specified.

3.04 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Clean adjacent construction and surfaces that may have been soiled in the course of installation of work in this section.

D. Provide all necessary protective measures to prevent exposure of equipment and surfaces from exposure to other construction activity.

E. Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

END OF SECTION

SECTION 123450
EPOXY RESIN LABORATORY WORK SURFACES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

B. SEFA 3 - Laboratory Work Surfaces; 2010.

1.03 SECTION INCLUDES

A. Molded, modified epoxy resin laboratory work surfaces.

1.04 RELATED SECTIONS

A. Documents affecting work in this section include but are not limited to the General Conditions, Supplementary Conditions and Sections in Division 01 – General Requirements of these Specifications.

B. Section 062000 - Finish Carpentry.

C. Section 105100 - Lockers.

D. Section 106600 - Shelving.

E. Section 123553.13 - Steel Laboratory Casework and Related Products.

F. Section 224000 - Plumbing Fixtures.

1.05 REFERENCES

A. SEFA 3-2010 Recommended Practices for Laboratory Work Surfaces.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.06 1.06 SUBMITTALS

A. Submit in accordance with Section 013000.

B. Submit four samples 4" x 6" of each color and thickness of material used.

C. Product Data: Submit manufacturer’s product data including material composition, physical properties, and chemical resistance data.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials in the manufacturer’s original protective packaging. Store materials in an enclosed shelter providing protection from damage and exposure to the elements.

B. Do not deliver or install work surfaces until building is enclosed and wet work is complete.

1.08 COORDINATION

A. Field Measurements: Secure field measurements before preparation of shop drawings and fabrication where possible, for proper and adequate fabrication and installation of the work.

B. Coordination: Furnish anchorage and top connection devices or material as specified.

1.09 WARRANTY

A. Worktops to be warranted against defects in material and workmanship for 10 years. The manufacturer must sign the Warranty documents and submit a copy to the Contractor.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Durcon, Inc., 1702 Lamons Road, Taylorsville, Mississippi 39168. Basis-of-Design Product: Kemresin Modified Epoxy Resin: www.durcon.com/#s
   2. LOC Scientific, Inc., 1815 Cypress Lake Drive, Orlando, Florida 32837. Product: Epoxy Resin Work Surface: www.loscientific.com/#sle.
   3. Kewaunee Scientific Corporation, 2700 West Front Street, Statesville, North Carolina 28677. Product: Epoxy Resin Work Surface: kewaunee.com/#sle.

B. B.All products specified in this section shall be provided by a single manufacturer.

2.02 2.02MATERIALS

A. Work surfaces shall be molded from solid modified epoxy resin, with smooth, non-specular, black finish.

B. Thickness:
   1. Typical work surface: 1 inch (25.4 mm) 25mm.
   2. Fume hood work surfaces: 1-1/4 inches (32 mm) 32mm thick at outer edge, indented 1/4 inch (6.35 mm) 6mm nominal to provide a raised rim around all exposed edges 1 inch (25.4 mm) 25mm wide minimum, or as required to allow for the fume hood sash.

C. Color: Non-specular black.

2.03 PHYSICAL PROPERTIES

A. Flexural Strength: Not less than 10,000 psi (68947.60 kPa).

B. Modulus of Elasticity: Not less than 2,000,000 psi (0.00 kPa).

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 degrees Fahrenheit (126.67 degrees Celsius).

F. Flame-Spread Index: 25 or less per ASTM E84.

G. Non-porous surface and edges.

H. Will not support micro-organic growth.

I. Will not support oxidation of material surface.

2.04 CHEMICAL RESISTANCE

A. Evaluation of chemical resistance is based on SEFA 3-2010 Laboratory Work Surfaces (Scientific Equipment and Furniture Association) standard list of 49 chemicals/concentrations, their required methods of testing (24 hour surface test) and their minimum acceptable results as a means of establishing a minimum acceptable level of performance for all exposed and semi-exposed surfaces.

B. Work surfaces shall achieve a rating of no effect or slight effect (SEFA Rating 0 or 1) for a minimum of 46 of the 49 SEFA 3 listed reagents.

2.05 FABRICATION

A. Drip grooves shall be provided on the underside at all exposed edges unless otherwise noted on Laboratory Furnishings Drawings.

B. All exposed edges to be finished smooth. Front top edge shall be rounded to a 1 inch (25.4 mm) radius for optimal performance. Vertical corners shall be rounded to a ¼" radius.

C. Fix work surface panels with blind fastenings into the back or underside of the panel. Use #10, type A sheet metal screws sized to stop at least 1/8" short of the finished face. Pre-drill panel with an 11/64" diameter high speed drill bit aligned with 7/32" clearance holes in the supporting structure.

D. Form tight-fitting butt joints in the work surface using two part epoxy adhesive, or mechanical fasteners positioned to be concealed after installation.

E. Curbs and splashes shall be 1 inch (25.4 mm) 25mm thick, bonded to the top of the work surface to form a square joint.

F. Splash Height: 4 inches (101.6 mm) 100mm, unless noted otherwise on Laboratory Furnishing Drawings. Backsplashes supporting pipe drop enclosures shall be 5 inches (127 mm) 127mm high or as indicated on the Drawings.

G. Cutouts for drop-in sinks shall be routed to form openings with 3/8" minimum depth supporting flanges and such that the rim of the sink when installed is at the same level as the work surface top. Epoxy sinks shall be set in beds of epoxy adhesive.

H. Cutouts for under-mounted sinks shall be routed and sanded to form smooth edged openings with the top edge radiused to approximately 1/8". The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than ¾". Under-mounted sinks shall be supported by brackets blind-fixed to the underside of the work surface.

I. Fume hood work surfaces shall include a 3/8" dished area to match the fume hood interior work space and form a water tight pan for spill containment.

J. Include a 2.5" diameter hole on each side of fume hood work surfaces for service pass-through and piping. Holes to be covered by hood superstructure upon installation.

2.06 2.06SOURCE QUALITY CONTROL

A. Fabricated work surfaces shall comply with all current codes and regulations. Tops and shelves shall have uniform thickness (+0.03") and flatness (maximum difference of 0.03") for 10 foot (304.8 cm) span.

B. Work surfaces shall be U.L. registered and labeled for quality consistency.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install worktops as per shop drawings on frames or base cabinets provided per specification.

B. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8".

C. Secure worktops to casework and equipment components with materials and procedures recommended by the manufacturer.

D. Where required due to field conditions, scribe to abutting surfaces.

3.02 PROTECTION

A. After installation, the General Contractor shall protect the worktops from damage. The tops shall be kept free from paint, plaster, cement scratches, or any other destructive forces.

END OF SECTION

SECTION 123553.13
STEEL LABORATORY CASEWORK AND RELATED PRODUCTS

PART 1 - SUMMARY AND SCOPE

1.01 RELATED DOCUMENTS

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

1.02 REFERENCE STANDARDS

A. NFPA 30 - Flammable and Combustible Liquids Code; 2021, with Amendment.

B. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2024.

C. SEFA 3 - Laboratory Work Surfaces; 2010.

1.03 SECTION INCLUDES

A. Furnish all cabinets and casework, including tops, ledges, supporting structures, and miscellaneous items of equipment as listed in these specifications, equipment schedules, and drawings. Include delivery to the building, set in place, level, and scribe to walls and floors as required. Furnish and install all filler panels, knee space panels and scribes as shown on drawings.

B. Furnish and deliver all utility service outlet accessory fittings, electrical receptacles and switches as listed in these specifications, equipment schedules, and drawings, as mounted on the laboratory furniture. All plumbing and electrical fittings, not preinstalled in equipment, shall be packaged separately and properly marked for delivery to the appropriate contractor.

C. Furnish and deliver, for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor, and where these items are part of the equipment or listed in these specifications, equipment schedules, and drawings. All tailpieces shall be furnished less the couplings required to connect them to the drain piping system.

D. Furnish service strip supports where specified, and set in place, service tunnels, service turrets, supporting structures and reagent racks of the type shown on the drawings.

E. Remove all debris, dirt and rubbish accumulated as a result of the installation of the laboratory furniture to an onsite container provided by others, leaving the premises broom clean and orderly.

1.04 RELATED DIVISIONS

A. Divisions 5 & 6: Behind-the-Wall Blocking and Studs

B. Base Molding

C. Chemical Fume Hoods

D. Plumbing

E. Electrical Fittings and Connections

F. Communications

1.05 1.05 RELATED PUBLICATIONS

A. SEFA 3 - Scientific Equipment and Furniture Association

B. SEFA 8 - Scientific Equipment and Furniture Association

C. NFPA 30 - National Fire Protection Association

D. NFPA 45 - National Fire Protection Association

E. UL - Underwriters Laboratories

F. ASTM D522 - Bending Test

1.06 UNDIVIDED RESPONSIBILITY

A. Unless specified otherwise, because of special coordination requirements, the supplier of the scope of work described in this Section shall also provide the scope of work described in the following Section:
   1. Section 115343 - Laboratory Service Fittings and Fixtures.

1.07 BASIS OF WORK

A. A. It is the intent of this specification to establish a standard of construction for laboratory furniture. The construction standards described herein shall provide the basis for quality and functional installation.

B. Supply all equipment in accordance with this specification. The offering of a product differing in materials and construction from this specification requires written approval from the owner/architect. This approval must be obtained seven (7) days before the quotation deadline.

C. General Contractors should secure a list of approved laboratory furniture manufacturers from the architect as a protection against non-conformance to these specifications.

D. Participants in the quotation process have the option of clarifying deviations to the specified design, construction, or materials. Without such clarifications, sealed quotations to the owner or owner representative will be construed as being in total conformance to the requirements of the specification.

E. The owner/owner’s representative reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

1.08 QUALITY ASSURANCE

A. The steel laboratory furniture contractor shall provide casework and worktops manufactured or shipped from the same geographic location to assure proper staging, shipment and single source responsibility.

B. General Performance: Provide certification that furniture shall meet the performance requirements described in SEFA 8.

C. Finish Performance: Provide independent test lab certification that furniture shall meet the performance requirements described in section 2.05 of these specifications.

1.09 SUBMITTALS

A. Manufacturer’s Data: Submit manufacturer’s data and installation instructions for each type of casework.

B. Samples:
   1. Samples from non-specified manufacturers will be required and reviewed per specification. Samples shall be delivered, at no cost to the architect or owner, to a destination set forth by the architect or owner. This must be done seven (7) days before quotation deadline as a condition of approval of each bidder. Samples shall be full size, production type samples. Miniature or "Show Room" type samples are not acceptable. Furnish the following:

a. One 18" combination (1) drawer and (1) cupboard base unit showing complete construction details, including (1) shelf
b. One 36" acid storage base cabinet typical of specified elevations
c. One sample of all top materials shown or called for, of sufficient size to perform finish requirement tests
d. Sample of all mechanical service fittings, locks, door pulls, hinges, and interior hardware

2. The architect or owner will retain the above samples of the successful manufacturer to ensure that material delivered to jobsite conforms in every respect to the samples submitted.

1.10 SHOP DRAWINGS

A. Submit shop drawings for furniture assemblies showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fittings.
1. Coordinate shop drawings with other work involved.
2. Provide roughing-in drawings for mechanical and electrical services when required.

PART 2 — PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
1. Kewaunee Scientific Corporation, 2700 West Front Street, Statesville, North Carolina 28677. Basis-of-Design Product: Research Collection: www.kewaunee.com/#sle.
2. Hamilton Scientific (Thermo Fisher Scientific), 1316 18th Street, Two Rivers, Wisconsin 54241: www.hamiltonlab.com/#sle.
3. LOC Scientific, Inc., 1815 Cypress Lake Drive, Orlando, Florida 32837: www.locscientific.com/#sle.

B. All laboratory equipment covered by the specification shall be the product of one manufacturer and be fabricated at one geographic location to assure shipping continuity and single-source responsibility.

C. The selected manufacturer shall warrant that all products be free of defects in material and workmanship for a period of three years. The period shall start at the date of acceptance or occupation, whichever comes first. Purchaser shall notify the manufacturer’s representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

2.02 CABINET MATERIAL

A. Steel:
1. Cabinet bodies, drawer bodies, shelves, drawer heads and door assemblies shall be fabricated from cold rolled steel.

2.03 DRAWER AND DOOR STYLE

A. Inset – Contour
1. Drawers and doors shall have a full width, integral contour radiused pull along the top edge, and when closed, shall be recessed to create an overall flush face with 1/8" reveals. The outer drawer and door head shall have a channel formation on all four sides to eliminate sharp raw edges of steel. The top front corners of the door shall be welded and ground smooth.

2.04 MATERIALS

A. General Requirements:
   1. It is the intent of this specification to provide a high quality steel cabinet specifically designed for the laboratory environment.

B. Steel:
   1. Cold Rolled Steel:
      a. Cold rolled sheet steel shall be prime grade 12, 14, 16, 18 and 20 gauge U.S. Standard; roller leveled, and shall be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects.

C. Hardware and Trim:
   1. Drawer and Door Pulls:
      a. Integral – Pull Style 5 – (Available for Inset Contour Style only)
         1) Pull shall be integrally formed at top of drawer and door, and offer a comfortable continuous handgrip. Use of aluminum, steel, or plastic pulls (molded or extruded), or a design not compatible for usage by the handicapped will not be acceptable.
   2. Sliding Door Pulls:
      a. Sliding door pulls shall be Aluminum-Recessed – Pull Style 9. Finger holes or slots machined into doors will not be acceptable.
   3. Hinges:
      a. Inset 5-Knuckle Hinges:
         1) Inset style cabinets shall use 5-Knuckle hinges made of Type 304 stainless steel .089 thick, 2-1/2" high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors under 36" in height shall be hung on one pair of hinges, and doors over 36" in height shall be hung on three hinges.
   4. Drawer Slide:
      a. Heavy duty, full extension, soft-close, self-closing, zinc plated, ball bearing slides, rated for 150 pound loads.
   5. Catches – For steel casework with 5-knuckle hinges:
      a. Positive Catch:
         1) A two-piece heavy-duty cam action positive catch. Main body of the catch shall be confined within an integral cabinet top or divider rail, while latching post shall be mounted on the hinge side of door. Polyethylene roller type catches are not acceptable.
   6. Elbow Catches:
      a. Elbow catches and strike plates shall be used on left hand doors of double door cases where locks are used, and are to be burnished cast aluminum, with bright brass finish.
   7. Shelf Adjustment Clips:
      a. Shelf adjustment clips shall be die formed, nickel-plated steel.
   8. Leg Shoes:
      a. Leg shoes shall be a pliable, black vinyl material and shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Use of a leg shoe which does not conceal leveling device will not be acceptable.
   9. Base Molding:

a. Base molding shall be black.

10. Sink Supports:
    a. Sink supports shall be the hanger type, suspended from end panels of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full-depth reinforcements, welded to the top of end panels. Two 3/4" x 1-1/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks.
11. Support Struts:
    a. Support struts shall consist of two 16 gauge channel uprights fastened top and bottom by two adjustable 12 gauge "U" shaped spreaders, each, 1-1/2" x length required, formed from galvanized steel. Struts shall be furnished to support drain troughs, and to support worktop at plumbing space under fume hood superstructures or other heavy loads. Support struts can be furnished with hangers at extra cost when specified, to support mechanical service piping and drain lines.

2.05 CONSTRUCTION

A. Steel Cabinet Construction:
   1. General:
      a. The steel furniture shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality casework shall be insured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity for the project.
      b. All cabinet bodies shall be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap. Exterior corners shall be spot welded with heavy back up reinforcements.
      c. Each cabinet shall be complete so that units can be relocated at any subsequent time without requiring field application of finished ends or other such parts.
      d. Case openings of Inset style cabinets shall be rabbeted on all four sides for both hinged and sliding doors to provide a dust resistant case.
      e. All cabinets shall have a cleanable smooth interior. Bottoms shall be formed down on sides and back to create easily cleanable corners with no burrs or sharp edges.
      f. Cabinets shall be designed using a standardized grid pattern to allow reconfiguration of doors and drawers.
   2. Steel Gauges:
      a. Gauges of steel used in construction of cases shall be 18 gauge, except as follows:
      b. Leveling bolt reinforcements 12 gauge.
      c. Top and intermediate front horizontal rails, apron rails, hinge reinforcements, and reinforcement gussets, 16 gauge.
      d. Drawer assemblies, door assemblies, bottom, bottom back rail, toe space rail, and adjustable shelves, 20 gauge.

B. Base Cabinets:
   1. End uprights shall be formed into not less than an L formation at top, bottom, back and a 3/4" wide front C formation. A pilaster shall be added to the inside front of the upright for cabinet and hinge reinforcement and shall be perforated for the support of drawer channels, intermediate rails, hinge screws, and shelf adjustment holes.

2. A 7/8" high top horizontal rail shall interlock with the flange at top of end panels for strength, but shall be flush at face of unit. Top rails not flush with face of end uprights are not acceptable.
3. Intermediate rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. Intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.
4. Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers.
5. Cabinet bottom shall be formed of one piece of steel, except in corner units, and shall be formed down on sides and back to create a square edge transition welded to cabinet end panels. Front edge shall include a C formation to form a 7/8" high bottom front rail and shall be flush with face of end uprights. Cabinet bottom front rails not flush with face of end uprights are not acceptable.
6. Toe space rail shall extend up and forward to engage bottom panel to form a smooth surfaced fully enclosed toe space, 3" deep x 4" high.
7. Back construction shall have a removable back panel.
8. Each bottom corner of base cabinets shall have a 3/8"-16 leveling bolt, 2-1/2" long capable of supporting 500 lbs. Access to the leveling bolts shall be through plug buttons in the cabinet bottom. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.
9. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear and formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
10. Steel Door assembly (two-piece) for solid panel swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material. Door assemblies shall be painted prior to assembly, and shall be punched for attaching pulls. Inner pan formation of door shall be indented for in-field installation of locks when required.
11. Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.
12. Drawer Assemblies:
    a. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation in drawer head providing a 3/4" thick drawer head.
13. Knee space panels, where shown or specified, shall be 20 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

C. Special Purpose Storage Cabinets:
    1. Acid Storage Fume Hood Cabinets:
        a. Acid storage fume hood cabinets shall utilize the same gauges of steel and construction features as other base cabinets except they shall be completely lined with a one piece polyethylene corrosion resistant liner. The liner shall be 1/4" thick,

molded into a seamless tub, including top, sides and bottom, with a 1" lip at the bottom front to contain spills. Tubs shall include integral cleats at both ends and back to support an optional shelf. Each door shall have a set of louvers at the top and bottom, and have a 1/8" sheet polyethylene liner. Where specified, each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe allowing a positive airflow directly into the fume hood exhaust system. When specified or shown on drawings, cabinet shall include a full-depth phenolic resin shelf.

2. Solvent Storage Cabinets:
    a. Solvent storage cabinets shall be specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by OSHA and NFPA 30, current edition, and cabinets shall be FM approved and labeled. The bottoms, top, sides and doors shall be fabricated of 18 gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A second pan shall be provided to serve as a full-depth adjustable shelf. Two, 2" diameter, diametrically opposed vents with spark screens shall be provided in the back of the cabinet as well as a grounding screw. The cabinet shall have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE - KEEP FIRE AWAY".

D. Upper Cabinet Construction:
    1. Upper cabinets shall have a completely finished interior same as exterior and shall be designed so that no mounting hardware is visible when installed.
    2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front edge of end upright shall be 3/4" wide. A pilaster shall be added to the inside front of the upright for cabinet and hinge reinforcement and shall be perforated for hinge screws, and shelf adjustment holes.
    3. Cabinet tops shall be formed with a 7/8" high C formation at the front edge and turned down at the back to engage a wall hanging rail.
    4. Cabinet flush bottoms shall be formed with a 7/8" high C formation at the front edge.
    5. Cabinet false bottoms shall be formed down on all four edges and shall be removable.
    6. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes. Holes shall be enclosed by end uprights.
    7. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
    8. Glazed doors shall be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening

in center of the door. Glass shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors shall be glazed with 1/8" float glass.

9. Solid panel doors shall consist of an inner and outer door pan. Outer door pan shall be formed into a channel or flanged shape at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.
10. Sliding doors shall be suspended from the top in a roll formed steel track fastened to the cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors.
11. Swinging doors under 36" high shall be hung on one pair of hinges, doors over 36" high shall be hung on three hinges.
12. Plate glass doors shall operate on an extruded aluminum track at the bottom of the cabinet, and in an extruded aluminum channel at the top. The bottom of each glass door shall be furnished with a continuous aluminum shoe the full length of the door, which shall be equipped with two nylon rollers that operate on the extruded aluminum track. The aluminum shoes on the bottom of the plate glass doors shall be equipped with pulls for operation of the doors, and also to prevent bypassing of the doors. Plate glass doors shall close against rubber bumpers. Plate glass doors shall be 1/4" float glass.

E. Steel Full Height Cabinet Construction:
1. Full height storage cabinets shall have a completely finished interior same as exterior.
2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front fascia of upright shall be 1-1/4" wide with inside edge formed in a channel 1/2" x 3/8". A full height box reinforcement shall be fitted to the channel, formed to provide a recessed strike for door and to reinforce the cabinet. The backside of the reinforcement shall be perforated with shelf adjustment holes spaced at not more than 1" centers. Back of upright shall be formed in a 2-1/2" formation. 16 gauge hinge reinforcement shall be welded to inner side of front uprights.
3. Cabinet tops shall be formed into a channel shape at front with flange at rear and sides for electro-welding cabinet top to cabinet back and ends. Front fascia channel shall be strengthened with electro-weld reinforcements.
4. Cabinet bottoms for storage cabinets shall be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless door recess rabbet for dust stop. Cabinet bottoms shall be formed to provide a flush 1" face rail with a return flange to give a 9/16" deep x 5" high toe space. All cabinets shall have a cleanable smooth interior.
5. Toe space rails shall interlock in back of bottom rail and with end panel to provide a welding plate, and shall extend to the floor with a flange turned back and up for support.
6. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be enclosed by a formation in cabinet back and enclosed by end uprights.
7. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation electro-welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
8. Glazed doors shall be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3"

wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Door glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors shall be glazed with 1/8" float glass.

9. Solid panel doors shall consist of inner and outer pan formations mechanically assembled after painting. All full height solid panel doors shall be further reinforced by a full-height channel formation welded to inner pan. Doors shall be 3/4" thick and contain sound deadening material.
10. Sliding doors shall be suspended from the top in a roll formed steel track welded to cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors.
11. Swinging doors under 36" high shall be hung on one pair of hinges, doors over 36" high shall be hung on three hinges.

F. Apron and Leg Assembly Construction:
1. In general, freestanding tables and/or apron and leg assemblies consist of welded leg assemblies connected to aprons by mechanical fasteners.
2. Table apron rails shall be formed of 16-gauge steel. The rails shall be 4" high, formed top and bottom into a channel formation. Where drawers occur, the apron rails shall provide the required opening.
3. Table legs shall be 2" square welded tubing. Securely welded to bottom end shall be a 14-gauge die formed gusset with four flanges. A threaded clinch nut shall accommodate a 3/8" 16 x 2-1/2" long leveling bolt. Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling bolts. Use of leg shoe which does not conceal leveling device will not be acceptable.
4. Stretchers shall be constructed of 18-gauge steel and furnished where indicated on drawings. They shall be formed into a 2-7/64" x 1-1/2" channel formation, and secured to table legs by a die-formed clip of 16-gauge steel. Clips shall be welded at ends of channel.

2.06 PERFORMANCE REQUIREMENTS

A. Steel Casework Construction Performance:
1. Base cabinets shall be constructed to support at least a uniformly distributed load 200 pounds per square foot of cabinet top area, including working surface without objectionable distortion or interference with door and drawer operation.
2. Base cabinet leveling bolts shall support 500 pounds per corner, at 1-1/2" projection of the leveling bolt below the cabinet bottom.
3. Each adjustable and fixed shelf 4 feet (121.92 cm) or shorter in length shall support an evenly distributed load of 40 pounds per square foot up to a maximum of 200 pounds, with nominal temporary deflection, but without permanent set.
4. Full extension soft-close, self-closing ball bearing zinc plated drawer slide shall be rated for 150 pound loads.
5. Swinging doors on floor-mounted inset style casework shall support 200 pounds suspended at a point 12" from hinged side, with door swung through an arc of 160 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plane in a closed position.

B. Steel Paint System Finish and Performance Specification:
1. Steel Paint System Finish:

a. After Cold Rolled Steel and Textured Steel component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.

b. After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. Color shall be as selected by architect from manufacturer's standard range. All components shall be individually painted, insuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

c. The completed finish system in standard colors shall meet the performance test requirements specified under Performance Test Results.

2. Performance Test Results (Chemical Spot Tests):

a. Testing Procedure:

1) Chemical spot tests for non-volatile chemicals shall be made by applying 5 drops of each reagent to the surface to be tested and covering with a 1-1/4" dia. watch glass, convex side down to confine the reagent. Spot tests of volatile chemicals shall be tested by placing a cotton ball saturated with reagent on the surface to be tested and covering with an inverted 2-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of 77° ±3° F. For both methods, leave the reagents on the panel for a period of one hour. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels.

b. Test Evaluation:

1) Evaluation shall be based on the following rating system.
2) Level 0 – No detectable change.
3) Level 1 – Slight change in color or gloss.
4) Level 2 – Slight surface etching or severe staining.
5) Level 3 – Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.
6) After testing, panel shall show no more than three (3) Level 3 conditions.

Test Reagents:

No.	Chemical Reagent	Test Method
1	Chemical Reagent	Test Method
2	Acetate, Amyl	Cotton ball & bottle
3	Acetate, Ethyl	Cotton ball & bottle

4	Acetone	Cotton ball & bottle
5	Acid Dichromate, 5%	Watch glass
6	Alcohol, Butyl	Cotton ball & bottle
7	Alcohol, Ethyl	Cotton ball & bottle
8	Alcohol, Methyl	Cotton ball & bottle
9	Ammonium Hydroxide, 28%	Watch glass
10	Benzene	Cotton ball & bottle
11	Carbon Tetrachloride	Cotton ball & bottle
12	Chloroform	Cotton ball & bottle
13	Chromic Acid, 60%	Watch glass
14	Cresol	Cotton ball & bottle
15	Dichlor Acetic Acid	Cotton ball & bottle
16	Dimethylformamide	Cotton ball & bottle
17	Dioxane	Cotton ball & bottle
18	Ethyl Ether	Cotton ball & bottle
19	Formaldehyde, 37%	Cotton ball & bottle
20	Formic Acid, 90%	Watch glass
21	Furfural	Cotton ball & bottle
22	Gasoline	Cotton ball & bottle
23	Hydrochloric Acid, 37%	Watch glass
24	Hydrofluoric Acid, 48%	Watch glass
25	Hydrogen Peroxide, 3%	Watch glass
26	Iodine, Tincture of	Watch glass
27	Methyl Ethyl Ketone	Cotton ball & bottle
28	Methylene Chloride	Cotton ball & bottle
29	Mono Chlorobenzene	Cotton ball & bottle
30	Naphthalene	Cotton ball & bottle
31	Nitric Acid, 20%	Watch glass
32	Nitric Acid, 30%	Watch glass
33	Nitric Acid, 70%	Watch glass
34	Phenol, 90%	Cotton ball & bottle
35	Phosphoric Acid, 85%	Watch glass
36	Silver Nitrate, Saturated	Watch glass
37	Sodium Hydroxide, 10%	Watch glass
38	Sodium Hydroxide, 20%	Watch glass
39	Sodium Hydroxide, 40%	Watch glass
40	Sodium Hydroxide, Flake	Watch glass
41	Sodium Sulfide, Saturated	Watch glass
42	Sulfuric Acid, 33%	Watch glass
43	Sulfuric Acid, 77%	Watch glass
44	Sulfuric Acid, 96%	Watch glass

45	Sulfuric Acid 77% and Nitric Acid 70%, equal parts	Watch glass
46	Toluene	Cotton ball & bottle
47	Trichloroethylene	Cotton ball & bottle
48	Xylene	Cotton ball & bottle
49	Zinc Chloride, Saturated	Watch glass

* Where concentrations are indicated, percentages are by weight.

3. Performance Test Results (Heat Resistance):
   a. Hot water (190° F - 205° F) shall be allowed to trickle (with a steady stream at a rate not less than 6 ounces per minute) on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.
4. Performance Test Results (Impact Resistance):
   a. A one-pound ball (approximately 2" diameter) shall be dropped from a distance of 12 inches (304.8 mm) onto the finished surface of steel panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close visual examination.
5. Performance Test Results (Bending Test):
   a. An 18 gauge steel strip, finished as specified, when bent 180° over a 1/2" diameter mandrel, shall show no peeling or flaking off of the finish.
6. Performance Test Results (Adhesion):
   a. Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot (3048 cm)-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".
7. Performance Test Results (Hardness):
   a. The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils are valued from 8-H (hardest) through 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B, 2-B, 3-B, 4-B, to 5-B (softest). The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one, that is, the hardest pencil that will not rupture the film, is then used to express or designate the hardness.

2.07 WORKSURFACES

A. Materials:
   1. Epoxy Resin Tops

B. Performance Requirements:
   1. Worksurface Fabrication and Installation: Premium Grade Laboratory Work Surface.
   2. Worksurface characteristics and performance shall be in compliance with SEFA, current edition.

C. Dimensions (thickness):
   1. Typical work surface: 1 inch (25.4 mm) 25mm.

2. Fume hood work surfaces:
    a. 1-1/4 inches (32 mm) 32mm thick at outer edge, indented 1/4 inch (6.35 mm) 6mm, nominal, to provide a raised rim around all exposed edges 1 inch (25.4 mm) 25mm wide, minimum, or as to allow for the fume hood sash.
    b. Front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3.18 mm) 3mm radius.
    c. Juncture between the raised rim and the top surface shall be coved or chamfered to a 1/4 inch (6.35 mm) 6mm radius.

D. Curbs and Splashes:
1. Curbs and Splashes: 1 inch (25.4 mm) 25mm thick.
2. Height: 4 inches (101.6 mm) 100mm, unless noted otherwise on Laboratory Furnishing Drawings.
    a. Backsplashes supporting pipe drop enclosures shall be 5 inches (127 mm) 127mm high or as indicated on the Drawings.

2.08 SINKS, CUPSINKS, AND DRAINS

A. Sinks: Refer to Section 115343 for sink types, materials, and requirements.
1. Molded Epoxy Resin Sinks

B. Cupsinks: Refer to Section 115343 for cupsink types, materials, and requirements.
1. Molded Epoxy Resin

C. Drain Troughs: Refer to Section 115343 for drain trough types, materials, and requirements.

2.09 FITTINGS

A. Materials: Refer to Section 115343 for service fitting materials and requirements.
1. Chrome-plated red brass or bronze

B. Construction: Refer to Section 115343 for service fitting construction and requirements.
1. Water Fittings
2. Distilled Water Fittings
3. Laboratory Ball Valves
4. Needle Valve Hose Cock
5. Gooseneck Type Outlets
6. Remote Control Valves
7. Tank Nipples
8. Sink Outlets
9. Vacuum Breakers
10. Electrical Fittings

C. Performance: Refer to Section 115343 for service fitting performance requirements.
1. Maximum line pressures
    a. Laboratory ball valves
    b. Needle point cocks
    c. Vacuum valve
    d. Water (H&C) valve
    e. Steam valve
2. Sepia bronze finish performance

PART 3 — EXECUTION

3.01 SITE EXAMINATION

A. The owner and/or his representative shall assure all building conditions conducive to the installation of a finished goods product; all critical dimensions and conditions previously checked have been adhered to by other contractors (general, mechanical, electrical, etc.) to assure a quality installation.

3.02 3.02INSTALLATION

A. Preparation:
   1. Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

B. Coordination:
   1. Coordinate the work of the Section with the schedule and other requirements of other work being prepared in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Performance:
   1. Casework:
      a. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.
      b. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
      c. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.
      d. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8".
   2. Worksurfaces:
      a. Where required due to field conditions, scribe to abutting surfaces.
      b. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory.
      c. Secure worksurfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

D. Adjust and Clean:
   1. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.
   2. Adjust doors, drawers and other moving or operating parts to function smoothly.
   3. Clean shop finished casework; touch up as required.
   4. Clean worksurfaces and leave them free of all grease and streaks.
   5. Casework to be left broom clean and orderly.

E. Protection:
   1. Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.
   2. Advise owner and/or his representative of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

END OF SECTION

SECTION 142400
HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

A. Complete hydraulic elevator systems.
   1. Service type.

B. Elevator Maintenance Contract.

1.03 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Includes elevator pit, overhead hoist beams, grouting thresholds, and grouting hoistway entrance frames.

B. Section 051200 - Structural Steel Framing: Includes hoistway framing, divider beams, overhead hoist beams, and associated accessories required for a complete installation.

C. Section 055000 - Metal Fabrications: Includes elevator pit ladder and sill supports.

D. Section 071616: Waterproofing of elevator pit walls and floor.

E. Section 078400 - Firestopping: Fire rated sealant in hoistway.

F. Section 092116 - Gypsum Board Assemblies: Gypsum shaft walls.

G. Section 220513 - Common Motor Requirements for Plumbing Equipment: Motor for sump pump in pit.

H. Section 260533.13 - Conduit for Electrical Systems:

I. Section 260583 - Wiring Connections:
   1. Electrical characteristics and wiring connections.
   2. Electrical service to main disconnect located in elevator shaft as located by elevator manufacturer.
   3. Emergency power transfer cabinet.
   4. Electrical power for elevator installation and testing.
   5. Electrical service for convenience outlets, elevator pit, and room-less elevator equipment closet.
   6. Lighting in elevator pit.
   7. Conduit for telephone service to location(s) as indicated on drawings.

J. Section 263600 - Transfer Switches: For interface with elevator controls.

K. Section 282000 - Video Surveillance: Installation of video camera in car interior for security monitoring.

L. Section 284600 - Fire Detection and Alarm:
   1. Fire and smoke detectors and interconnecting devices.
   2. Fire alarm signal lines to elevator controller cabinet.

1.04 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

C. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

D. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).

E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

F. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

G. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

I. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

J. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

M. ITS (DIR) - Directory of Listed Products; Current Edition.

N. NEMA MG 00001 - Motors and Generators; 2024.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

Q. UL (DIR) - Online Certifications Directory; Current Edition.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
      a. Elevator equipment devices remote from elevator machine room or hoistway.
      b. Remote group automatic panel in lobby from controller cabinet.
      c. Elevator pit for lighting, sump pump, and any other necessary items.
      d. Automatic transfer switch from controller cabinet.
      e. Fire alarm panel from controller cabinet.
   2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
      a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
      b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.

B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
   1. Review schedule of installation, proper procedures and conditions, and coordination with related work.

C. Construction Use of Elevator: Not permitted.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit data on following items:
   1. Signal and operating fixtures, operating panels, and indicators.
   2. Car design, dimensions, layout, and components.
   3. Car and hoistway door and frame details.
   4. Electrical characteristics and connection requirements.

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
   1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
   2. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
   3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
   4. Clearances and over-travel of car.
   5. Locations in hoistway of traveling cables and connections for car lighting, telephone, and emergency systems required.
   6. Location and sizes of hoistway and car doors and frames.
   7. Electrical characteristics and connection requirements.
   8. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.

D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, handrail material and finish, and elevator sill in the form of cut sheets, finish color selection brochures, or color samples.

E. Designer's Qualification Statement.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Welders’ Qualification Statement: Welders’ certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

I. Testing Agency's Qualification Statement.

J. Initial Maintenance Contract.

K. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
   1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.

L. Operation and Maintenance Data:
   1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Operation and maintenance manual.
   3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

M. Specimen warranty.

N. Executed warranty.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and approved by elevator equipment manufacturer.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

F. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

A. Manufacturer Warranty: Provide 1-year manufacturer warranty for elevator operating equipment and devices. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hydraulic Elevator Manufacturers:
   1. Basis of Design:
      a. TK Elevator; EnduraMRL 2-Stage 4500 SP110 FrontRear 4-6D Left: www.tkelevator.com/#sle.
   2. Alternate Manufacturers:
      a. Otis Elevator Company; HYDROFIT 4500H: www.otis.com/#sle.

B. Substitutions: See Section 016000 - Product Requirements.

C. Source Limitations: Provide elevator and associated equipment and components produced by the same manufacturer as the other elevator equipment used for this project and obtained from a single supplier.

2.02 HYDRAULIC ELEVATORS

A. Provide machine-roomless holeless hydraulic elevators from ThyssenKrupp Elevator. The control system and car design based on materials and systems manufactured by ThyssenKrupp Elevator. Specifically, the system shall consist of the following components:
   1. The entire hydraulic system and the controller shall be located inside the hoistway. No extra machine room or control closet space is required.
   2. Sleep mode operation for LED ceiling lights and car fan.
   3. LED lighting standard in ceiling lights and elevator fixtures.
   4. Sleep mode operation for LED ceiling lights and car fan.

B. Hydraulic Service Elevator:
   1. Hydraulic Elevator Equipment:
      a. Holeless hydraulic with cylinder mounted within hoistway.

2. Drive System:
   a. Variable voltage variable frequency (VVVF) to modulate motor speed.
3. Operation Control Type:
   a. Selective Collective Automatic Operation Control.
4. Service Control Types:
   a. Standard service control.
   b. Restricted Access service control.
5. Interior Car Height: 96 inch (2438 mm).
6. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
7. Rated Net Capacity: 4500 pounds (2041 kgs).
8. Rated Speed: 125 to 150 feet per minute (0.63 to 0.75 m per second).
9. Hoistway Size: As indicated on drawings.
10. Interior Car Platform Size: As indicated on drawings.
11. Elevator Pit Depth: 48 inch (1219 mm).
12. Overhead Clearance at Top Floor: 144 inch (3658 mm).
13. Travel Distance: As indicated on drawings.
14. Number of Stops: As indicated on drawings.
15. Number of Openings: 1 Front; 2 Rear.
16. Hydraulic Equipment Location: As indicated on drawings

2.03 COMPONENTS

A. Elevator Equipment:

B. Hoistway Components:
   1. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
      a. Car Guide Rails: Tee-section steel rails with brackets and fasteners.
   2. Buffers:
      a. Spring type for elevators with speed less than or equal to 200 fpm (1 m/sec).
         1) Polyurethane type buffers shall be used.
   3. Lubrication Equipment:
      a. Provide grease fittings for periodic lubrication of bearings.
      b. Grease Cups: Automatic feed type.
      c. Lubrication Points: Visible and easily accessible.

C. Electrical Equipment:
   1. Motors: NEMA MG 1.
   2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70.
   3. Sump Pump in Pit: See Section 220513.
   4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.
   5. Include wiring and connections to elevator devices remote from hoistway. See Section 260583.
      a. Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Perform welding of steel in accordance with AWS D1.1/D1.1M.

E. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.

F. Perform electrical work in accordance with NFPA 70.

G. Comply with venting or pressurization of hoistway design in accordance with HVAC system requirements and authorities having jurisdiction (AHJ).

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide landing operating panels, landing indicator panels, and any other components required for a complete, compliant system.
   1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
   2. Landing Indicator Panels: Illuminating.
   3. Comply with ADA Standards for elevator controls.

B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, building management control, and any Owner required systems.

C. Door Operation Controls:
   1. Program door control to open doors automatically when car arrives at floor landing.
   2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
   3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.

2.06 OPERATION CONTROL TYPE

A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
   1. Refer to description provided in ASME A17.1.
   2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
   3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
   4. All "UP" landing calls are made when car is traveling in the up direction.
   5. All "DOWN" landing calls are made when car is traveling in the down direction.
   6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.

2.07 SERVICE CONTROL TYPE

A. Restricted Access Service Control:
   1. Program up traveling cars to stop at main floor landing prior to proceeding to a designated higher dispatch landing.

2.08 EMERGENCY POWER

A. Set-up elevator operation to run with building emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Building Emergency Power Supply: Supplied by backup generator; provide elevator system components as required for emergency power characteristics with phase rotation the same as for normal power.
   1. Provide transfer switches and auxiliary contacts.

2. Install connections to power feeders.

C. Emergency Lighting: Comply with ASME A17.1 elevator lighting requirements.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

B. Stainless Steel Sheet: ASTM A666/A666M, Type 304; No. 4 Brushed finish unless otherwise indicated.

C. Tempered Glass: 3/8 inch (9.5 mm) minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.

2.10 CAR AND HOISTWAY ENTRANCES

A. Elevator, :
   1. Car and Hoistway Entrances, Main Elevator Lobby:
      a. Hoistway Fire Rating: 2 Hours.
      b. Elevator Door Fire Rating: 1-1/2 Hours.
      c. Framed Opening Finish and Material: Brushed stainless steel.
      d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
      e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
      f. Door Type: Double leaf.
      g. Door Operation: Side opening, two speed.
      h. Door Width: 42 inches (1.067 m).
      i. Door Height: 96 inches (2.438 m).
      j. Sills: Manufacturer's standard.
   2. Car and Hoistway Entrances, Upper Floor Elevator Lobbies:
      a. Hoistway Fire Rating: 2 Hours.
      b. Elevator Door Fire Rating: 1-1/2 Hours.
      c. Framed Opening Finish and Material: Brushed stainless steel.
      d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
      e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
      f. Door Type: Double leaf.
      g. Door Operation: Side opening, two speed.
      h. Door Width: 42 inches (1.067 m).
      i. Door Height: 96 inches (2.438 m).
      j. Sills: Manufacturer's standard.

B. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.

C. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.

D. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

E. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to eliminate audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

F. Entrance marking plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

G. Sight Guards: sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel and gold satin doors.

2.11 CAR EQUIPMENT AND MATERIALS

A. Elevator Car:
1. Car Design: Model EnduraMRL 2-Stage 4500 SP110 FrontRear 4-6D Left by TKE .
2. Car Operating Panel: Provide main and auxiliary; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and emergency phone.
   a. Panel Material: Integral with front return; one per car.
   b. Car Floor Position Indicator: Above car operating panel with illuminating position indicators.
   c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch (1.372 m) above car finished floor.
   d. Provide matching service cabinet integral with front return panel, with hinged door and keyed lock in each car.
   e. Provide following within service cabinet as part of car operating panel:
      1) Switch for each auxiliary operational control, keyed.
      2) Switches for fan, light, inspection control, and necessary accessories as required.
      3) Emergency light.
      4) Telephone cabinet and hard-wired connection with telephone.
      5) Control for each other special feature specified.
      6) Convenience outlet receptacle; 110VAC, 15 amps.
3. Ventilation: Single speed fan with grille in ceiling.
4. Flooring: Resilient sheet flooring.
5. Wall Base: Recessed stainless steel, 4 inch (102 mm) high.
6. Front Return Panel: Match material of car door.
7. Door Wall: Stainless steel.
8. Side Walls: Stainless steel.
9. Rear Wall: Stainless steel.
10. Hand Rail: Stainless steel, at each side wall. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
    a. Round, Metal Tube: 1-1/2 inch (38 mm) diameter.
    b. Stainless Steel Finish: No. 4 Brushed.
11. Ceiling:
    a. Canopy Ceiling: Stainless steel.
    b. Frame Finish: Color anodized aluminum.
    c. Lighting: As selected from manufacturer's standard line.
12. Provide emergency access panel for egress from car at ceiling.

B. Car Accessories:
1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1; brass grommets for supports, covering side and rear walls and front return, with cut-out for control panel; provide one set for each elevator.

a. Color: As selected by Architect.
b. Provide at least 4 inch (102 mm) clearance from bottom of pad to finished floor.
c. Pad Supports: Stainless steel studs, and mounted from wall mounted channel.

2.12 FINISHES

A. Color Anodized Finish: Class I, AAMA 611 AA-M12C22A44, electrolytically deposited colored anodic coating not less than 0.7 mil, 0.0007 inch (0.018 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify that hoistway, pit, and elevator lobbies are ready for work of this section.

C. Verify hoistway shaft and openings are of correct size and within tolerance.

D. Verify location and size of machine foundation and position of machine foundation bolts.

E. Verify that electrical power is available and of correct characteristics.

3.02 PREPARATION

A. Arrange for temporary electrical power for installation work and testing of elevator components; see Section 015000 - Temporary Facilities and Controls for additional requirements.

B. Maintain elevator pit excavation free of water.

C. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Coordinate this work with installation of hoistway wall construction.

B. Install system components, and connect equipment to building utilities.

C. Provide conduit, electrical boxes, wiring, and accessories; see Sections 260533.13 and 260583.

D. Install hydraulic piping between cylinder and pump unit.

E. Mount machines, motors, pumps, and all other equipment as recommended by manufacturer on vibration and acoustic isolators.
1. Place on structural supports and bearing plates.
2. Securely fasten to building supports.
3. Prevent lateral displacement.

F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.

H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

I. Bolt or weld brackets directly to structural steel hoistway framing.

J. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.

K. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

L. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

M. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.

N. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Testing and inspection performed at discretion of regulatory agencies certified in accordance with ASME QEI 1.
   1. Schedule tests with agencies and notify Owner and Architect.
   2. Obtain permits as required to perform tests.
   3. Document regulatory agency tests and inspections in accordance with requirements.
   4. Perform tests required by regulatory agencies.
   5. Furnish test and approval certificates issued by authorities having jurisdiction.

C. Operational Tests:
   1. Perform operational tests in the presence of Owner and Architect.
      a. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner’s representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.
   2. Test single elevator system by transporting at least 4 persons up from main floor to top floor landings during a five minute period.

3.06 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch (6.4 mm) maximum from flush with sill.

3.07 CLEANING

A. Remove protective coverings from finished surfaces.

B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

C. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, cleaning and maintenance of each component.

D. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site, unless noted otherwise.

3.09 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until Date of Substantial Completion.

C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to initial maintenance service.

B. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 3 months from Date of Substantial Completion.

C. Submit proposal for continuation of Maintenance Contract in accordance with ASME A17.1 and requirements as indicated for installed elevator equipment.

D. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.

E. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.

F. Examine system components periodically.

G. Include systematic examination, adjustment, and lubrication of elevator equipment.

H. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

I. Perform work without removing cars from use during peak traffic periods.

J. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

K. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION