

PROJECT MANUAL
Volume 1
Construction Documents

PENDER COUNTY SCHOOLS
K-8 SCHOOL
PENDER COUNTY, NORTH CAROLINA
ARCHITECT'S PROJECT NO.: 631310

MOSELEYARCHITECTS

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CHARLOTTE, NORTH CAROLINA

BID SET

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TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

Refer to Bordeaux General Inclusions and Bidding and Procurement Documents under separate cover.

SPECIFICATIONS

VOLUME 1

DIVISION 1 – GENERAL REQUIREMENTS

011000	Summary
012100	Allowances
012200	Unit Prices
012300	Alternates
012500	Substitution Procedures
012501	Substitution Request Form (After Receipt of Bids)
014000	Quality Requirements
014200	Definitions and Reference Standards
014520	Testing, Adjusting, and Balancing for HVAC
016000	Product Requirements
017000	Execution and Closeout Requirements
017419	Construction Waste Management and Disposal
017800	Closeout Submittals
017900	Demonstration and Training
018119	Indoor Air Quality Requirements
018316	NFPA 285 Exterior Wall Assembly Requirements
018317	Exterior Building Enclosure Air Barrier Requirements
019113	General Commissioning Requirements

DIVISION 2 – EXISTING CONDITIONS

024100	Demolition
--------	------------

DIVISION 3 – CONCRETE

031000	Concrete Forming and Accessories (Site)
032000	Concrete Reinforcing (Site)
033000	Cast-In-Place Concrete
034500	Precast Architectural Concrete

DIVISION 4 – MASONRY

042000	Unit Masonry
047200	Cast Stone Masonry

DIVISION 5 – METALS

051200	Structural Steel Framing
052100	Steel Joist Framing
053100	Steel Decking
054000	Cold Formed Steel Framing – Structural (CFSF-S)
054003	Continuous Insulation (CI) Framing System, Clipped

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

055000	Metal Fabrications
055100	Metal Stairs
055133	Metal Ladders
055213	Pipe and Tube Railings

DIVISION 6 – WOOD PLASTICS AND COMPOSITES

061000	Rough Carpentry
064100	Architectural Woodwork and Casework

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

071300	Sheet Waterproofing
072100	Thermal Insulation
072736	Sprayed Foam (SPF) Air Barrier
074213	Metal Wall Panels
074213.23	Metal Composite Material Wall Panels
075423	TPO Membrane Roofing
076200	Sheet Metal Flashing and Trim
077100	Roof Specialties
077200	Roof Accessories
078400	Firestopping
078426	Thermal Barriers for Plastics
079200	Joint Sealants
079513	Expansion Joint Cover Assemblies

DIVISION 8 – OPENINGS

081113	Steel Doors and Frames
081416	Flush Wood Doors
081613	Fiberglass Doors
083100	Access Doors and Panels
083313	Coiling Counter Doors
083323	Overhead Coiling Doors
084313	Aluminum-Framed Storefronts
084413	Glazed Aluminum Curtain Walls
087100	Door Hardware
088000	Glazing
088300	Mirrors
088733	Decorative Films
088813	Fire-Rated Glazing
089100	Louvers

DIVISION 9 – FINISHES

092216	Cold Formed Steel Framing - Non-Structural (CFSF-NS)
092900	Gypsum Board
093000	Tiling
095100	Acoustical Ceilings
096466	Wood Athletic Flooring
096467	Dance Flooring Assemblies
096513	Resilient Base and Accessories

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

096519	Resilient Tile Flooring
096566	Resilient Athletic Flooring
096623	Resinous Matrix Terrazzo Flooring
096700	Fluid-Applied Flooring
096813	Tile Carpeting
098430	Sound-Absorbing Wall and Ceiling Units
099100	Painting

DIVISION 10 – SPECIALTIES

101100	Visual Display Units
101200	Display Cases
101400	Signage
102113.19	Plastic Toilet Compartments
102123	Cubicle Curtains and Track
102239	Folding Panel Partitions
102600	Wall and Door Protection
102800	Toilet and Bath Accessories
104400	Fire Protection Specialties
105113	Metal Lockers
105613	Metal Storage Shelving
107500	Flagpoles

DIVISION 11 – EQUIPMENT

112300	Commercial Laundry Equipment
113013	Residential Appliances
114000	Foodservice Equipment
115100	Library Furnishings
115213	Projection Screens
116143	Stage Curtains
116613	Ballet Barres
116623	Gymnasium Equipment
116733	Climbing Walls
116843	Exterior Scoreboards

DIVISION 12 – FURNISHINGS

122400	Window Shades
123553.19	Wood Laboratory Casework
123583	Music Equipment Storage Casework and Accessories
125600	Metal Worktables - Freestanding
126600	Telescoping Stands

DIVISION 13 – SPECIAL CONSTRUCTION – Not Used

DIVISION 14 – CONVEYING SYSTEMS

142400	Hydraulic Elevators
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VOLUME 2

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

DIVISION 21 – FIRE SUPPRESSION

210500	Common Work Results for Fire-Suppression
211000	Water-Based Fire-Suppression Systems

DIVISION 22 – PLUMBING

220500	Common Work Results for Plumbing
220513	Common Motor Requirements for Plumbing Equipment
220516	Expansion Fittings and Loops for Plumbing Piping
220517	Sleeves and Sleeve Seals for Plumbing Piping
220519	Meters and Gages for Plumbing Piping
220523	General-Duty Valves for Plumbing Piping
220529	Hangers and Supports for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220700	Plumbing Insulation
221113	Facility Natural Gas Piping
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties
221125	Circulating Pumps
221316	Sanitary Waste and Vent Piping
221319	Sanitary Waste Piping Specialties
221413	Facility Storm Drainage Piping
221423	Storm Drainage Piping Specialties
221429	Sump Pumps
223400	Fuel-fired Domestic Water Heaters
224000	Plumbing Fixtures

DIVISION 23 – MECHANICAL

230500	Common Work Results for HVAC
230513	Motors for HVAC Equipment
230514	Variable Speed Drives
230516	Expansion Fittings and Loops for HVAC Piping
230517	Sleeves and Sleeve Seals for HVAC Piping
230519	Meters and Gages for HVAC Piping
230523	General-Duty Valves for HVAC Piping
230529	Hangers and Supports for HVAC Piping and Equipment
230533	Heat Tracing for HVAC Piping
230548	Vibration Control for HVAC
230553	Identification for HVAC Piping and Equipment
230700	HVAC Insulation
230900	Building Automation System
230993	Sequence of Control for HVAC
232113	Hydronic Piping
232123	Hydronic Pumps
232300	Refrigerant Piping
232500	HVAC Water Treatment
233113	Metal Ducts
233300	Air Duct Accessories
233423	HVAC Power Ventilators

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

233713	Diffusers, Registers, and Grilles
233723	HVAC Gravity Ventilators
234100	Particulate Air Filtration
235100	Breechings, Chimneys, and Stacks
235216	Condensing Boilers
236426	Air-Cooled Rotary Screw Water Chillers
237219	Air-to-Air Energy Recovery Units
237313	Modular Indoor Central Station Air Handling Units
237433	Makeup Air Units
238126	Ductless Mini-Split Air Conditioning Units
238143	Split System Heat Pumps
238219	Fan Coil Units
238240	Electric Unit Heaters

DIVISION 25 – INTEGRATED AUTOMATION – Not Used

DIVISION 26 – ELECTRICAL

260519	Low-Voltage Electrical Power Conductors
260526	Grounding and Bonding for Electrical Systems
260529	Hangers and Supports for Electrical Systems
260533	Raceway and Boxes for Electrical Systems
260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
260553	Identification for Electrical Systems
260572	Overcurrent Protective Device Short-Circuit Study
260573	Overcurrent Protective Device Coordination Study
260574	Overcurrent Protective Device Arc-Flash Study
260923	Lighting Controls
260943	Relay-Based Lighting Controls
262200	Low-Voltage Transformers
262413	Switchboards
262416	Panelboards
262726	Wiring Devices
262813	Fuses
262816	Enclosed Switches and Circuit Breakers
263213	Engine Generators
263600	Transfer Switches
264113	Lightning Protection for Structures
264313	Surge Protection for Low-Voltage Electrical Power Circuits
265119	LED Interior Lighting
265619	LED Exterior Lighting

DIVISION 27 – COMMUNICATIONS

270500	Common Work Results for Communications
270526	Grounding and Bonding for Communication Systems
270528	Pathways for Communications Systems
270536	Cable Trays for Communications Systems
271100	Communications Equipment Room Fittings
271300	Communications Backbone Cabling

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

271500	Communications Horizontal Cabling
274116	Audiovisual Systems
275227	Two-Way Communication Intercom System
276410	RF BDA-Based Signal Booster System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

280500	Common Work Results for Electronic Safety and Security
280513	Conductors and Cables for Safety and Security
283111	Emergency Voice Communication System

DIVISION 31 – EARTHWORK

311001	Site Grubbing
312213	Rough Grading
312316	Excavation
312316.13	Trenching
312323	Fill
312500	Erosion and Sedimentation Controls

DIVISION 32 – EXTERIOR IMPROVEMENTS

321123	Aggregate Base Courses
321216	Asphalt Paving
321313	Concrete Paving
321413	Precast Concrete Unit Paving
321723	Pavement Markings
323113	Chain Link Fences and Gates
323119	Ornamental Fence (to be issued by addendum)
329200	Turf and Grasses
329223	Sodding
329300	Exterior Plants

DIVISION 33 – UTILITIES

330110	Disinfection of Water Utility Piping Systems
330505.31	Hydrostatic Testing
330505.43	Mandrel Testing
330507	Boring and Jacking
330533.16	HDPE Drainage Piping
330561	Concrete Manholes
331413	Public Water Utility Distribution Piping
331417	Site Water Service Utility Laterals
331419	Valves and Hydrants for Water Utility Service
334200	Stormwater Conveyance

DIVISION 34 – TRANSPORTATION – Not Used

END OF TABLE OF CONTENTS

**SECTION 011000
SUMMARY**

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Pender K-8 School.
- B. Owner's Name: Pender County Schools.
- C. Design-Build Contractor: Bordeaux Construction Company, Inc.
- D. Architect's Name: Moseley Architects of Raleigh, NC.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A Design-Build contract based on a competitively bid Guaranteed Maximum Price (GMP) as described in the Owner's Bidding and Contractual requirements provided under separate cover.

1.03 PROFESSIONAL SEALS

- A. Use of Professional Seals on Bidding, Procurement, and Contract Documents: For the purposes of this paragraph, the term "Regulant" refers to the individual who signs and seals parts of the Contract Documents (e.g. the Drawings and Specifications). Certain information has been excerpted verbatim from a source or sources (e.g., UL assemblies, SMACNA details, applicable state/jurisdiction building code) which was considered or used by Regulant in preparing parts of the Contract Documents, as follows:
 - 1. The excerpted information was neither prepared under the direct control nor personal supervision nor created by the Regulant, as it was prepared by the source and owner of the excerpted information.
 - 2. For purposes of bidding, procuring, and performance of the Work, and in any event of conflicts or ambiguities between the excerpted information in the Contract Documents and the requirements of applicable codes and standards, provide the better quality or greater quantity of Work which, at a minimum, complies with the requirements of the applicable codes and standards.
 - 3. Advise Architect immediately upon becoming aware of requirements of the Work which are not consistent with the requirements of the excerpted information.
 - 4. Attribution is acknowledged for information obtained and included herein verbatim from other source or sources.
 - 5. Regulant has taken into consideration and used certain excerpted information from other sources which are applicable to the Contract Documents, and the Regulant indicates by its seal that it is assuming responsibility for its services in use and application of the excerpted information to the requirements of Work, but not for the excerpted information itself which was prepared by others. Regulant does not indicate by its seal that it is responsible for use or application of other information in such source or sources which was not included herein.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.
 - 1. Maintain routes of egress and life safety systems for Owner and occupants at all times.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Time Restrictions:
 - 1. Comply with local regulations for hours of work, noise ordinances, and similar requirements.
- D. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.
- E. Controlled Substances: The use of alcohol and drugs is not permitted on the Project site. Provide a designated outdoor smoking area for construction personnel that is at least 30 feet away from the building.

1.06 SPECIFICATION SECTIONS APPLICABLE TO ALL WORK

- A. The provisions of the Owner/Contractor agreement, General Conditions of the Contract, Supplementary Conditions (if any), and all Division 01 sections shall apply to all sections of the Project Manual.
- B. Some requirements included in the Division 01 sections may overlap with requirements in Division 0 Bidding and Procurement Documents, including Bordeaux General Inclusions document. In the event of overlap or conflict, the Division 0 / Bordeaux General Inclusions shall govern.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

**SECTION 012100
ALLOWANCES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Allowance Proposal: Submit initial proposal for purchase of products and materials, on Change Order form.
- B. Supporting Documentation:
 - 1. Products and Material: Provide invoices and other documents as required, for products and materials indicating quantities, prices, taxes, delivery fees, and other costs.
 - 2. Labor and Installation: Provide time sheets and other documents as required, indicating all on-site Subcontractor costs, including hours worked, quantity or amount of product/material installed, hourly wages, and Subcontractor overhead and profit.

1.02 LUMP-SUM AND QUANTITY ALLOWANCES

- A. Costs Included in Lump-Sum and Quantity Allowances: All Subcontractor's costs: Cost of products and materials, taxes, freight, delivery, receiving and handling, labor and installation, Subcontractor overhead and profit.
- B. Costs Not Included in Lump-Sum and Quantity Allowances: All General Contractor's costs: General coordination, GC's overhead and profit.
- C. Contractor Responsibilities:
 - 1. Assist Architect in selection of products.
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
- D. Differences in costs will be adjusted by Change Order.

1.03 LUMP SUM ALLOWANCE SCHEDULE

- A. Lump Sum Allowance No. 1: Include the stipulated sum of \$1,500 per thousand units for face brick type #1, as specified in Division 4, Section "Unit Masonry."
- B. Lump Sum Allowance No. 2: Include the stipulated sum of \$1,500 per thousand units for face brick type #2, as specified in Division 4, Section "Unit Masonry."
- C. Lump Sum Allowance No. 3: Include a stipulated sum of \$5,000 for painted center court logo in gymnasium, as specified in Division 09 Section "Wood Athletic Flooring."
- D. Lump Sum Allowance No. 4: Include the stipulated sum of \$30,000 for interior and exterior panel signage, as specified in Division 10 Section "Signage."
- E. Lump Sum Allowance No. 5: Include the stipulated sum of \$5,000 for foodservice equipment changes, as specified in Division 11, Section "Foodservice Equipment."

1.04 QUANTITY ALLOWANCE SCHEDULE

- A. Quantity Allowance No. 1: Include 100 cubic yards for unsuitable soils (trench) removal and disposal offsite for building concrete. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- B. Quantity Allowance No. 2: Include 100 cubic yards for replacement of unsuitable soils (trench) with import select fill for building concrete. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- C. Quantity Allowance No. 3: Include 100 cubic yards for replacement of unsuitable soils (trench) with #57 stone for building concrete. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- D. Quantity Allowance No. 4: Include 50 cubic yards of flowable fill for building concrete. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- E. Quantity Allowance No. 5: Include 200 cubic yards of aggregate base course stone (NCDOT CABC). Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- F. Quantity Allowance No. 6: Include removal and restoration of 500 CMU blocks. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- G. Quantity Allowance No. 7: Include 1500 square feet of thermal barrier for SPF insulation (SFRM). Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- H. Quantity Allowance No. 8: Include 1000 square feet of additional floor leveling for hard tile. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- I. Quantity Allowance No. 9: Include 61,250 square feet of moisture vapor treatment (MVT) for resilient flooring. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- J. Quantity Allowance No. 10: Include 74,000 square feet of moisture vapor treatment (MVT) for resin matrix terrazzo. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- K. Quantity Allowance No. 11: Include 5 additional sprinkler heads. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- L. Quantity Allowance No. 12: Include 100 cubic yards for unsuitable soils (trench) removal and disposal offsite for plumbing. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- M. Quantity Allowance No. 13: Include 100 cubic yards for replacement of unsuitable soils (trench) with import select fill for plumbing. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- N. Quantity Allowance No. 14: Include 100 cubic yards for replacement of unsuitable soils (trench) with #57 stone for plumbing. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- O. Quantity Allowance No. 15: Include 100 cubic yards for unsuitable soils (trench) removal and disposal offsite for electrical. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- P. Quantity Allowance No. 16: Include 100 cubic yards for replacement of unsuitable soils (trench) with import select fill for electrical. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- Q. Quantity Allowance No. 17: Include 100 cubic yards for replacement of unsuitable soils (trench) with #57 stone for electrical. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- R. Quantity Allowance No. 18: Include furnishing and installation of 5 horn strobes. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- S. Quantity Allowance No. 19: Include furnishing and installation of 5 fire alarm pull stations. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- T. Quantity Allowance No. 20: Include furnishing and installation of 5 exit lights. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- U. Quantity Allowance No. 21: Include furnishing and installation of 5 smoke detectors. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- V. Quantity Allowance No. 22: Include furnishing and installation of 5 duplex receptacles. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- W. Quantity Allowance No. 23: Include furnishing and installation of 5 data outlets. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- X. Quantity Allowance No. 24: Include furnishing and installation of 5 duct detectors. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- Y. Quantity Allowance No. 25: Include furnishing and installation of 5 exterior lights. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- Z. Quantity Allowance No. 26: Include furnishing and installation of 5 wireless access points. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- AA. Quantity Allowance No. 27: Include 200 linear feet of PVC sleeves under pavements and drives. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.
- BB. Quantity Allowance No. 28: Include 1500 square yards of additional sod. Coordinate with Division 1, "Unit Prices" for unit price requirements that will be used to determine allowance adjustments.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012100

**SECTION 012200
UNIT PRICES**

PART 1 GENERAL

1.01 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.02 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.03 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated on the Drawings or in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the Drawings or individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified via mutual agreement, and by personnel authorized by Owner, if required.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.
- E. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes; calculate and certify quantities for payment purposes.

1.04 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected Products.

1.05 SCHEDULE OF UNIT PRICES

- A. Unit Prices 1, 12, and 15: Unsuitable soils.
 - 1. Unit Price shall cover the removal of unsuitable soil and transportation off-site disposal. Unit price shall be measured by the cubic yard (CY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- B. Unit Prices 2, 13, and 16: Replacement of unsuitable soils with import select fill.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Unit Price shall cover import select fill material and transportation to the site. Unit price shall be measured by the cubic yard (CY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- C. Unit Prices 3, 14, and 17: Replacement of unsuitable soils with #57 stone.
 1. Unit Price shall cover the cost of #57 stone and transportation to the site. Unit price shall be measured by the cubic yard (CY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- D. Unit Price 4: Replacement of unsuitable soils with flowable fill.
 1. Unit Price shall cover flowable fill material and transportation to the site. Unit price shall be measured by the cubic yard (CY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- E. Unit Price 5: Replacement of unsuitable soil with CABC stone.
 1. Unit Price shall cover the CABC stone and transportation to the site. Unit price shall be measured by the cubic yard (CY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- F. Unit Price 6: Replace and restore CMU.
 1. Unit Price shall cover the cost of CMU removal or restoration. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- G. Unit Price 7: Thermal air barrier for SPF insulation.
 1. Unit Price shall cover the cost of installing additional thermal air barriers for SPD insulation. Unit price shall be measured by the square foot (SF). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- H. Unit Price 8: Floor leveling.
 1. Unit Price shall cover the installation of floor leveling under hard tile. Unit price shall be measured by the square foot (SF). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- I. Unit Prices 9 and 10: Moisture Vapor Treatment (MVT):
 1. Unit Price shall cover providing a surface-applied moisture vapor treatment, to be applied to concrete slabs prior to installation of floor finishes. Unit price shall be measured by the square foot (SF). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- J. Unit Price 11: Additional sprinkler heads.
 1. Unit Price shall cover furnish and install of additional sprinkler heads, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- K. Unit Price 18: Additional horn strobes.
 1. Unit Price shall cover furnish and install of additional horn strobes, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- L. Unit Price 19: Additional fire alarm pull stations.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Unit Price shall cover furnish and install of additional fire alarm pull stations, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- M. Unit Price 20: Additional exit lights.
1. Unit Price shall cover furnish and install of additional exit lights, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- N. Unit Price 21: Additional smoke detectors.
1. Unit Price shall cover furnish and install of additional smoke detectors, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- O. Unit Price 22: Additional duplex receptacles.
1. Unit Price shall cover furnish and install of additional duplex receptacles, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- P. Unit Price 23: Additional data outlets.
1. Unit Price shall cover furnish and install of additional data outlets, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- Q. Unit Price 24: Additional duct detectors.
1. Unit Price shall cover furnish and install of additional duct detectors, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- R. Unit Price 25: Additional exterior lights.
1. Unit Price shall cover furnish and install of additional exterior lights, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- S. Unit Price 26: Additional wireless access points.
1. Unit Price shall cover furnish and install of additional wireless access points, over or in addition to those required by the Contract Documents. Unit price shall be measured by the unit. This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- T. Unit Price 27: PVC sleeves under pavements and drives.
1. Unit Price shall cover furnish and install of PVC sleeves for electrical work under pavements and drives. Unit price shall be measured by linear foot (LF). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.
- U. Unit Price 28: Additional sod.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Unit Price shall cover furnish and install of additional sod, over or in addition to the quantity required by the Contract Documents. Unit price shall be measured by the square yard (SY). This unit price shall be provided in coordination with Quantity Allowance; refer to Division 01, Section "Allowances" for more information.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012200

**SECTION 012300
ALTERNATES**

PART 1 GENERAL

1.01 ACCEPTANCE OF ALTERNATES

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

1.02 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 (Owner-Preferred Alternate): BAS Controls manufacturer.
 - 1. Base Bid Item: Provide Building Automation System Controls by manufacturer complying with specification requirements per Section 230900 "Building Automation System".
 - 2. Alternate Item: Provide Building Automation System Controls by Engineered Controls Solutions (ECS).
- B. Alternate No. 2: (Owner-Preferred Alternate): Finish Hardware.
 - 1. Base Bid: Provide locks, closers and exit devices by manufacturer complying with specification requirements per Section 087100 Finish Hardware.
 - 2. Alternate Item: Provide Best locks, Best closers and Best Precision exits.
 - 3. Alternate Item: Provide the Best IMPLSW-2 code import.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012300

**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control, such as unavailability, regulatory changes, or unobtainable warranty terms.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. A copy of the Substitution Request Form that shall be used is included at the end of this Section for informational purposes. Request a Word or editable PDF version of the form from the Architect and complete the form digitally; do not complete the form by hand.
 - 2. Contractor's Substitution Request documentation must include the following:
 - a. Substitution Request Information:
 - 1) Indication of whether the substitution is for cause or convenience.
 - 2) Issue date.
 - 3) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 4) Description of Substitution.
 - 5) Reason why the specified item cannot be provided.

- 6) Description of how proposed substitution affects other parts of work.
- b. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
- c. Impact of Substitution: Provide data indicating cost savings to Owner and change in Contract Time due to accepting substitution.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Architect will consider requests for substitutions for convenience only during the procurement (bidding) period.
- B. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION 012500

Substitution Request Form – After Receipt of Bids

All Substitution Requests shall be submitted by the Contractor only. Substitution Requests received from subcontractors, sub-subcontractors, manufacturers, vendors, etc., will be “rejected” without review.

General Information				
Project Name				
A/E Project Number				
Specified Product/Item Information				
Specification Title				
Section				
Page				
Article / Paragraph				
Description				
Proposed Substitution Information				
Proposed Substitution				
Reason for not providing specified product/item				
Comparative Data	Attach a point-by-point comparative data list. Include all differences between the proposed substitution and the specified product/item. If not provided, this Request will be rejected.			
Manufacturer				
Manufacturer Address				
Manufacturer Phone				
Manufacturer Representative Email address				
Trade / Model Name				
Model Number				
Installer				
Installer Address				
Installer Phone				
History	<input type="checkbox"/> New product	<input type="checkbox"/> 2-5 years	<input type="checkbox"/> 5-10 yrs	<input type="checkbox"/> 10 yrs or longer
Proposed substitution affects other parts of the Work	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
If yes, explain				
Savings to Owner for accepting proposed substitution	\$			
Proposed substitution affects Contract Time	<input type="checkbox"/> Yes		<input type="checkbox"/> No	

If yes	<input type="checkbox"/> Add	<input type="checkbox"/> Deduct
If yes, number of calendar days		
Proposed Substitution Similar Installation		
Have you (this Contractor) used this product/item on any other projects	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Project		
Project Address		
Architect/Engineer		
A/E Phone		
Owner		
Owner Phone		
Date installed		
Attached Supporting Data		
<input type="checkbox"/> Drawings	<input type="checkbox"/> Product Data/Specs	<input type="checkbox"/> Samples
<input type="checkbox"/> Tests	<input type="checkbox"/> Reports	<input type="checkbox"/>

Contractor certifies all of the following:

- Contractor shall provide specified product/item in the event this Substitution request is rejected.
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein.
- If applicable, proposed substitution shall not adversely affect LEED requirements nor shall it prevent achieving the relative number of applicable LEED point[s] the specified product would have received.
- Proposed substitution’s function, appearance, and quality are equal or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein.
- Same or superior warranty and/or guarantees shall be furnished for proposed substitution as is required for the specified product/item.
- Same maintenance service and source replacement parts, as applicable, are available; including local availability.
- Proposed substitution shall have no adverse effect on other trades.
- Cost data as stated herein is complete. Claims for additional costs related to the accepted proposed substitution which may subsequently become apparent shall be waived; including licenses, fees, and/or royalties.
- Proposed substitution shall not affect dimensions and functional clearances. If the proposed substitution does affect dimensions and/or functional clearances, Contractor shall adjust the Work as required and necessary to accommodate the proposed substitution at no additional cost to the Contract.
- Payment shall be made by the Contractor, via a deduct/credit Change Order, for changes to the building design, including A/E fees for the design and detailing, caused by the proposed substitution.
- Coordination, installation, and changes to the Work as necessary for the accepted proposed substitution shall be complete in all respects.

Contractor Information

Submitted by	
Signed By	
Date	
Email address of Signee above	
Company Name	
Address	
Phone	

Architect / Engineer Review and Action	
<p>Acceptance of this substitution request is an acceptance of only the manufacturer and product/item for general conformance with the design concept reflected in the Contract Documents. The A/E has made no attempt to verify specific performance data, or to check the details of the proposed substitution as to special features, capacities, physical dimensions, or code and/or regulatory compliance, all of which remain the responsibility of the Contractor.</p>	
<input type="checkbox"/>	Proposed Substitution is found to be acceptable for inclusion in Change Order, if approved by Owner – Provide submittals in accordance with Contract Document requirements.
<input type="checkbox"/>	Proposed Substitution is found to be acceptable as noted for inclusion in Change Order, if approved by Owner - Provide submittals in accordance with Contract Document requirements.
<input type="checkbox"/>	Proposed Substitution is rejected – Provide specified product/item.
<input type="checkbox"/>	Proposed Substitution submittal/form not in accordance with Contract Documents (not timely, incomplete)
Comments / Remarks	
Reviewed by	
Signed By	
Date	

END OF SUBSTITUTION REQUEST FORM

**SECTION 014000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.02 DEFINITIONS

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

1.03 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary sheeting, shoring, or supports.
 - 2. Temporary scaffolding.
 - 3. Temporary bracing.
 - 4. Temporary falsework for support of spanning or arched structures.
 - 5. Temporary foundation underpinning.
 - 6. Temporary stairs or steps required for construction access only.
 - 7. Temporary hoist(s) and rigging.
 - 8. Investigation of soil conditions and design of temporary foundations to support construction equipment.
 - 9. Additional temporary controls as required.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Information to Architect if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Design Services/Delegated Design: As required by individual specification sections.

1.05 SUBMITTALS

- A. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. Test Reports: After each test/inspection, require testing agency to promptly distribute digital copy of report to Architect, Owner, Contractor, and others as required.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports:
 - 1. Submit report promptly to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under OSHA's Nationally Recognized Testing Laboratory (NRTL) program or through the National Institute of Standards and Technology's (NIST's) National Voluntary Laboratory Accreditation Program (NVLAP).
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling, including inspections by authorities having jurisdiction and special inspections.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.

- c. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

1.07 REFERENCES AND STANDARDS

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

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform Special Inspections and other specified testing indicated in individual specification sections.
 - 1. Refer to Division 01 Section "Special Inspections Services" and Structural Drawings for additional special inspections requirements and for Statement of Special Inspections.
- B. Where indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency: Testing agency shall comply with requirements of ASTM E329, and shall be certified through OSHA's Nationally Recognized Testing Laboratory (NRTL) program or through the National Institute of Standards and Technology's (NIST's) National Voluntary Laboratory Accreditation Program (NVLAP).
 - 1. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.

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

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- E. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- F. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- G. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

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

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
 - B. Testing Agency Duties for Contractor-Employed Testing and Inspection Agencies:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
-

5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the Work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 7. Coordinate repairs where testing and inspection has damaged the Work.
- E. Re-testing and/or re-inspections required because of non-compliance with specified requirements shall be performed by the same agency. Do not proceed with construction activities that would conceal or cover work needing re-testing or re-inspection.
- F. Re-testing and/or re-inspections required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and field quality control requirements as applicable, and to initiate instructions when necessary.
- B. Provide a written report of observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions or Contract Documents. Obtain Owner's approval prior to proceeding with any modifications.

3.06 DEFECT ASSESSMENT

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

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- B. Contractor may request to restore defective Work or portions of the Work to comply with specified requirements in lieu of replacement. Obtain Owner's approval prior to proceeding with restoration.
- C. If, in the opinion of Owner, it is not practical to restore or remove and replace the work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION 014000

SECTION 014200
DEFINITIONS AND REFERENCE STANDARDS

PART 1 GENERAL

1.01 SUMMARY

- A. The definitions include in this section supplement, but do not replace, the definitions contained in the General Conditions. In the event of duplication, the General Conditions shall govern.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.
- F. Installer: A Contractor or other entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that specified requirements apply exclusively to tradespeople of the corresponding generic name.
- G. Experienced: When used with the term "Installer," this term means having successfully completed previous work similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with the requirements of local authorities having jurisdiction.
- H. Replace: Provide an acceptable like product or material in place of a missing or unacceptable (rejected) product or material. To "replace" an unacceptable product or material includes its removal and disposal.
- I. Punch List: A written list of unfinished Work and defective Work resulting from inspection and testing to determine whether Substantial Completion has been accomplished. The unfinished Work and defective Work must be finished and corrected to obtain Substantial or Final Completion, in accordance with the General Conditions.
- J. Written or Printed: When used in conjunction with manufacturer's product data or installation requirements, either of these terms may be used to require compliance with manufacturer's current printed and published information.

1.03 REFERENCE STANDARDS

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified, or are required by applicable codes or local authorities having jurisdiction.

- B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 014200

SECTION 014520 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Balancing Air Systems:
 - a. Constant-volume air systems.
- 2. Balancing Hydronic Piping Systems:
 - a. Variable-flow hydronic systems.
 - b. Primary-secondary hydronic systems.
- 3. Testing, Adjusting, and Balancing Equipment:
 - a. Heat exchangers.
 - b. Motors.
 - c. Chillers.
 - d. Condensing units.
 - e. Boilers.
 - f. Heat-transfer coils.
- 4. Testing, adjusting, and balancing existing systems and equipment.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation system.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: If requested by the Owner or Architect, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB agent and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 90 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports: Within 14 days of completion of balancing work, submit testing and balancing report.
- G. Sample report forms.

1.6 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB. TAB provider shall be an independent company from the contractors performing the work.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- D. The following information shall be submitted as part of the Quality Assurance Submittal:
1. Provide evidence of satisfactory completion of at least two projects of similar size and scope. Submit the following for each project:
 - a. Completed testing and balancing reports for each project.
 - b. If not included in the testing and balancing report, provide equipment startup checklists for each project.
 - c. Owner contact for each project.
 - d. Design engineer contact for each project.
 - e. Architect contact for each project.
 2. The Architect shall determine whether the agent is qualified and the decision shall be final. Re-submittals on behalf of the same company shall not be considered.
- E. TAB Conference: After approval of the TAB submittals, the TAB specialist shall arrange a meeting with the Owner's and the Architect's representatives to develop a mutual understanding of the details and review the TAB strategies and procedures plan. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installer, and other support personnel. Provide 14 days' notice of scheduled meeting time and location.
1. Minimum Agenda:
 - a. Submittal distribution requirements.
 - b. Contract documents examination report.
 - c. TAB strategies and procedures plan.
 - d. Work schedule and project site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
 - g. Systems readiness checklists.
- F. TAB Reports: Use standard forms from AABC's "National Standards for TAB" or NEBB's "Procedural Standards for TAB of Environmental Systems."
- G. Instrumentation Type, Quantity, and Accuracy: As described in the "AABC National Standards for Total System Balance" or NEBB's "Procedural Standards for TAB of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

- A. Coordinate the efforts of work performed under other sections for operation of systems and equipment to support and assist TAB activities.
- B. Notice: Provide 7 days' notice to the Contractor and Architect for each test. Include scheduled test dates and times.
- C. Perform TAB after any required leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.9 WARRANTY

- A. General Warranty: The national project performance guarantee indicated in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Guarantee: Provide a guarantee on NEBB or AABC forms stating that NEBB or AABC will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.

- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.
 - 2. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230700 "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after they have been adjusted.

- D. Verify final system conditions.
 - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 - 2. Re-measure and confirm that total airflow is within design.
 - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 - 4. Mark all final settings.
 - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 - 6. Measure and record all operating data.
 - 7. Record final fan-performance data.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 - 1. Check liquid level in expansion tank.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 5. Verify that motor starters are equipped with properly sized thermal protection.
 - 6. Check that air has been purged from the system.

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
 - 1. Verify that the differential-pressure sensor is located as indicated.
 - 2. Determine whether there is diversity in the system.
- C. For systems with no diversity:
 - 1. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.

- 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
- b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
- c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
6. Prior to verifying final system conditions, determine the system differential-pressure set point.

7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
 3. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
 4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
13. Verify that memory stops have been set.

3.8 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first.
- B. Balance the secondary circuits after the primary circuits are complete.
- C. Adjust pumps to deliver total design gpm.
 1. Measure total water flow.

- a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- D. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- E. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- F. For systems with pressure-independent valves at terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- G. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- H. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.

2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

I. Verify that memory stops have been set.

3.9 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.10 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.11 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.12 PROCEDURES FOR BOILERS

A. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures.
2. Measure and record water flow.
3. Record relief valve pressure setting.

3.13 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.14 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: 0 to plus 10 percent.
2. Air Outlets: Plus or minus 10 percent.
3. Return Inlets: Plus or minus 10 percent.
4. Exhaust Inlets: 0 to plus 10 percent.
5. Heating-Water Flow Rate: Plus or minus 10 percent.
6. Cooling-Water Flow Rate: Plus or minus 10 percent.
7. Unless indicated otherwise: Plus or minus 10 percent.

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.15 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.16 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.

2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch.
 - f. Make and model number.
 - g. Face area in square feet.
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.

- i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
- G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
- 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
- 1. Unit Data:

- a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Airflow rate in cfm.
 - i. Face area in square feet.
 - j. Minimum face velocity in fpm.
2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Airflow rate in cfm.
 - c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.

- e. Suction static pressure in inches wg.
- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in square feet.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- K. Air-Terminal-Device Reports:
- 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in square feet.
 - 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
- 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.

- d. Coil make and size.
 - e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
1. Unit Data:
- a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
2. Test Data (Indicated and Actual Values):
- a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.
- N. Instrument Calibration Reports:

1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.17 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of commissioning authority.
- B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 3. If the second verification also fails, Owner may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.18 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.
- C. When requested, provide up to 32 hours by the technician that provided services under this Section to support commissioning.

END OF SECTION 014520

**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Comparable Product: An unnamed product that is similar in quality and performance to named product(s).
- B. Basis-of-Design Product: A specific product selected by the Architect for use in the design process; based on certain performance characteristics, physical qualities or details, a specialized finish type, pattern, or color, or other indicated characteristics.

1.02 WARRANTIES

- A. Product warranties shall be provided in addition to and run concurrently to Contractor's general warranty/guarantee.
 - 1. Unless otherwise indicated, all warranty terms shall start on the date of Substantial Completion.
- B. Manufacturer's Warranty: A standard warranty issued by the product manufacturer, covering production and material defects.
- C. Special Warranties: Warranties in addition to standard manufacturer's warranty, covering fabrication, installation, or specific performance items such as weathertightness
- D. Warranty Form: Warranty shall be provided on either manufacturer's standard form or on specified form. When a sample warranty form is not included in the Project Manual, the warranty shall be on mutually agreed form.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 014000 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Containing lead, cadmium, or asbestos.

2.02 PRODUCT OPTIONS

- A. Products Specified with a Single Named Product: Where required by Owner due to facility standards, provide the named product; no options or substitutions allowed.
- B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- E. Products Specified by Naming One or More Manufacturers with a Provision for Comparable Products: Unnamed comparable product may be submitted after award of Contract. Comply with requirements in "Comparable Products" article below.

2.03 BASIS-OF-DESIGN PRODUCTS

- A. Where a product is specified by naming a Basis-of-Design, comply with the following:
 - 1. Where a list of additional manufacturers is provided, provide the Basis-of-Design product or a comparable product by one of the listed manufacturers, in compliance with "Comparable Products" article below.
 - 2. Where a list of additional manufacturers is not provided, provide the Basis-of-Design product, or submit a substitution request in compliance with Section 012500 - Substitution Procedures.
 - 3. Basis-of-Design characteristics shall include requirements in the Specifications and on the Drawings.
 - 4. Where the Basis-of-Design lists a specific finish, manufacturers wishing to submit as a Comparable Product or as a substitution shall certify that they are able to provide an exact match to the specified finish, or that they will provide a custom finish to match.

2.04 COMPARABLE PRODUCTS

- A. Where a product is specified with a provision for comparable products, Contractors submitting a Comparable Product shall comply with the following:
 - 1. The submitted product shall not require changes to the Work, unless specifically approved by Architect. If changes are required, the Contractor shall resubmit the product as a substitution request, and the Contractor shall bear the cost of the changes, coordinate with other impacted contractors, and provide appropriate notations on record documents.
 - 2. Contractor shall provide, with the submittal, a detailed breakdown comparing the submitted product to at least one of the other listed products; list specified performance qualities, test results, dimensions, finish, and other critical properties.
 - 3. Contractor shall provide warranty data indicating that submitted Comparable Product complies with indicated warranty term(s).
- B. Comparable product submittals are subject to Architect's final approval. If a proposed product is found to be unacceptable, Contractor shall revert to one of the named products.

2.05 COLOR/FINISH OPTIONS

- A. Preselected Color/Finish: Where a specific manufacturer's premium or custom finish or color is indicated as the basis-of-design, other listed manufacturers shall certify that they can provide an exact match, or that they will provide pricing under the assumption that a custom finish or color will be required.
- B. Color/Finish Selection: Unless specifically indicated to either be a custom color or to be selected from manufacturer's standard range, color and finish selections shall be made from manufacturer's full range of options, including premiums, metallics, wood grains, etc.

2.06 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 011000 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

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

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide off-site storage and protection when site does not permit on-site storage or protection.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Do not store products directly on the ground.
- L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M. Prevent contact with material that may cause corrosion, discoloration, or staining.
- N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

**SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.02 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.03 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust and Silica Control: Execute work by methods to minimize raising dust and silica from construction operations. Provide positive means to prevent air-borne dust and silica from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof enclosures to prevent entry of dust and silica that is generated outdoors.
 - 2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

- I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- K. Hazardous Materials: Do not use materials or products that contain hazardous substances, for permanently installed products and materials, installation materials, or for cleaning or other construction use.

1.04 COORDINATION

- A. See Section 011000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
 - B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
 - C. Examine and verify specific conditions described in individual specification sections.
-

- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

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

3.03 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Fire Safety: Comply with provisions of 2018 International Fire Code, Chapter 33; "Fire Safety During Construction and Demolition" for preventing damage to structures under construction.
 - 1. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
 - B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
 - C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
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- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

- A. Perform cutting and patching to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- B. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to specified condition.
- C. Employ skilled and experienced installer to perform cutting and patching.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material to maintain existing fire ratings, to full thickness of the penetrated element.
- G. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

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

3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
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- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
- G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- H. Prohibit traffic from landscaped areas.
- I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 SYSTEM STARTUP AND ADJUSTING

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Testing, Adjusting, and Balancing of HVAC Systems: Refer to Division 1 Section "Testing, Adjusting, and Balancing for HVAC."
- J. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 DEMONSTRATION AND INSTRUCTION

- A. See Section 017900 - Demonstration and Training.

3.10 FINAL CLEANING

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

3.11 CLOSEOUT PROCEDURES

- A. Prior to Substantial Completion, complete the following:
 - 1. Provide startup, testing, and adjusting of all systems and equipment.
 - a. Demonstrate that air and water systems are balanced and that automatic temperature control system is in control of all equipment. This may require separate demonstrations if controls cannot be tested for applicable seasons of the year.
 - b. Submit written certification that testing/adjusting/balancing operations have been completed, and that systems are operation and under control in conformance with applicable specification section(s).
 - c. Submit written certification that all Building Commissioning has been completed.
 - d. Complete testing of the electronic security systems and equipment, demonstrating security control.
 - 2. Provide all inspections required by local authorities having jurisdiction to obtain Certificate of Occupancy, and provide written certification of completion of Special Inspections.
 - 3. Provide preventive maintenance services for all equipment used prior to Substantial Completion, and provide initial maintenance servicing for all products and equipment that will be subject to ongoing maintenance/service contracts.
 - 4. Provide final cleaning of all products, materials, and equipment, and provide touch up and restoration of exposed materials and finishes.
 - 5. Provide fresh batteries in all battery-powered products and equipment.
 - 6. Provide demonstration and training for Owner's personnel on all required systems and equipment.
 - 7. Coordinate a walkthrough with the Owner and the local fire department and other emergency services.
 - 8. To the maximum extent possible, remove temporary facilities and controls, construction equipment and tools, and similar items that are not part of the finished Work.
 - 9. Coordinate changeover with the Owner of permanent utilities, insurance requirements, and building's permanent keying and lock system.
- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- D. Conduct Substantial Completion inspection with representatives of Owner and Architect, and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. At the Architect's sole discretion, based on the amount of outstanding work, the Architect may elect to decline to issue a Certificate of Substantial Completion and will provide a list of outstanding items that are required to obtain Substantial Completion. The Contractor shall request reinspection after the indicated items have been completed.
- E. Upon approval, the Architect shall prepare and distribute Certificate of Substantial Completion, and will include a list of outstanding items and Final Correction Punch List.
- F. The Owner will occupy the building after Substantial Completion, as specified in Section 011000.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- I. Prior to final completion, complete the following:
 1. Ensure that the Certificate of Substantial Completion is fully executed by all required parties.
 2. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.
 3. Provide final pest and rodent control treatments and inspections.
 4. Remove any remaining construction equipment, tools, and materials; perform additional cleaning required due to construction activities following Substantial Completion, and leave the site prepared for Owner occupancy.
 5. Submit final demonstration and training materials and videos, as built/record documents, operation and maintenance binders, and warranty binders.
 6. Submit final application for payment.

3.12 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
 1. Contractor's maintenance responsibility shall be through Substantial Completion, unless a longer term is required by individual specification section.
- B. Maintenance service shall not be assigned or transferred to any agent or third party without prior written consent of the Owner.

END OF SECTION 017000

**SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
 - 1. Fire Safety: Comply with ICC (IFC) International Fire Code, Chapter 33 "Fire Safety During Construction and Demolition" and with NFPA 241 for provisions relating to accumulation and removal of combustible debris and waste.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
 - B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
 - C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
 - D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
 - E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
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- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.

- b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
- a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to Contractor's site superintendent, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Coordinate with Division 2 demolition contractor to properly identify and separate recyclables. Store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Recycling of Existing Carpet: Remove carpet; cut sheet carpet to 4 foot widths, tightly roll, and pack in container. Palletize carpet tiles on 36 inch or smaller pallets; maximum 4 foot high. Tightly bind or shrink wrap packaged carpeting. Include carpet padding where applicable.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Coordinate with Division 2 demolition contractor.
 2. Coordinate with Division 9 carpet installer to include waste and scrap from new carpet work as applicable.
 3. Refer to Carpet America Recovery Effort (CARE) guidelines and ship or deliver carpet to a designated reclamation/recycling facility.
- I. Recycling of Existing Acoustical Ceiling Panels: Verify with ACP manufacturer that existing ceiling tiles can be recycled. Following verification, remove and stack ceiling tiles on pallets and wrap or band the pallet loads for pick up or delivery per recycler guidelines.
1. Coordinate with Division 2 demolition contractor.
 2. Coordinate with Division 9 ACP manufacturer's recycling program; contact recycler when there is a full trailer load or approx. 30,000 square feet of removed ceiling. Coordinate with recycler to arrange pick up from the project site and transport to recycling facility at no cost.
 3. If quantity to be recycled is less than 30,000 square feet, coordinate with ACP manufacturer for delivery to a consolidation point/facility at Contractor's cost.
- J. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- K. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 017419

**SECTION 017800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect within 15 days after the date of Substantial Completion.
- B. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within 15 days after acceptance.
 - 2. Submit one PDF draft copy of completed documents within 15 days after the Closeout Conference. This copy will be reviewed and returned, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 3. After revisions are complete, submit one bound hard copy and PDF electronic file of revised final documents in final form within 15 days after Substantial Completion.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 15 days after acceptance.
 - 2. Make other submittals within 15 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 15 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Addenda.
 - 3. Change Orders and other modifications to the Contract.
 - 4. Miscellaneous record submittals.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
 - 1. Include revised Drawings reissued during Bidding and Construction.
- C. Store record documents separate from documents used for construction.
 - 1. Keep record documents in a location accessible to Architect for periodic review and reference.
 - 2. Maintain in legible condition. If record document set becomes damaged or excessively dirty, transfer comments to clean set prior to submittal to Architect.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- F. Miscellaneous Record Submittals: Where other specification sections require completion certifications, or closeout or record submittals, submit in a single binder organized by specification section.

3.02 ASSEMBLY OF RECORD DOCUMENTS

- A. Submittal for Architect's Review:
1. Submit PDF scanned copy of marked up prints.
 2. Architect shall review and provide comment on completeness
- B. Submittal for Distribution to Owner:
1. After Architect has approved for content and completeness, submit PDF scanned copy of final marked up prints, and submit hard copy originals.
 2. Submit full set of Drawings, regardless of whether any modification or markings are on each sheet.

3.03 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.04 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
 2. Identify function, normal operating characteristics, and limiting conditions.
 3. Include performance curves, with engineering data and tests.

4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

3.06 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
 - B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
 - C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
 - D. Cover: Identify each binder on front and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
 - E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
 - F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
 - G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
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- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.07 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 15 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Retain warranties and bonds until time specified for submittal.
- D. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- E. Cover: Identify each binder on front and spine with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- F. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- G. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- H. Provide photocopy of each warranty in operation and maintenance manuals; locate each warranty with applicable O&M data for product or equipment.

END OF SECTION 017800

**SECTION 017900
DEMONSTRATION AND TRAINING**

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products, systems, equipment, and other items where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance of products, systems, equipment, and as otherwise indicated in specific specification sections.

1.02 SUBMITTALS

- A. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit not less than four weeks prior to start of training.
 - 2. Revise and resubmit until acceptable.
 - 3. Provide an overall schedule showing all training sessions.
 - 4. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- B. Training Manuals: Provide training manual for each attendee.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- C. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
- D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.
 - 3. Where available, provide manufacturer's pre-produced training videos in conjunction with live demonstration and training video.

1.03 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Instructor shall be certified by the manufacturer or fabricator of system.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

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

3.02 TRAINING - GENERAL

- A. Conduct training on-site, utilizing installed products and equipment, unless otherwise indicated.
- B. Provide training in minimum two hour segments.
- C. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- D. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 2. Typical uses of the O&M manuals.
- E. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

4. Discuss cleaning products and procedures, including recommended cleaning products and products that are detrimental to equipment operation or finishes.
 5. Provide hands-on training on all operational modes possible and preventive maintenance.
 6. Emphasize safe and proper operating requirements; discuss relevant health and safety issues, warning or error indications, and emergency procedures and shutdown.
 7. Discuss common troubleshooting problems and solutions. Include minor adjustments for resolving noise, vibration, and improving system efficiency.
 8. Discuss any peculiarities of equipment installation or operation.
 9. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage. Include discussion of continuing maintenance agreements and procedures.
 10. Review recommended tools and spare parts inventory suggestions of manufacturers.
 11. Review spare parts and tools required to be furnished by Contractor.
 12. Review spare parts suppliers and sources and procurement procedures.
- F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 017900

**SECTION 018119
INDOOR AIR QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY

- A. Provide Indoor Air Quality (IAQ) Management Plan to remain in force during the construction period.
- B. Chapter 3 of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 2nd Edition 2007, available from SMACNA (703-803-2980 or www.smacna.org).

1.02 SUBMITTAL

- A. Construction Indoor Air Quality Management Plan (CIAQM Plan).

PART 2 OBJECTIVES DURING CONSTRUCTION

2.01 PROTECTION

- A. Store all materials and equipment in a protected area (inside warehouse or storage trailer). Protect materials and equipment that are too large or heavy to store in a trailer from water and dirt/dust/debris.
 - 1. OPTION: When stored outside, provide two layers of minimum 8-mil poly on the ground and elevate equipment or material a minimum of 4 inches to allow water to run off. Secure top and sides with two layers of 8-mil poly to prevent water penetration and dust/dirt accumulation.
- B. Protect HVAC equipment from dust and odors. Do not store equipment in areas near painting, pressure washing, or excavation. Do not operate equipment during cutting or grinding of masonry or concrete.
 - 1. Refer to Division 23 for construction filter requirements for protection of mechanical duct systems during construction.
 - 2. Clean ductwork when installed. Cap ends with poly during construction to prevent contamination.
 - 3. Do not operate HVAC system until the exterior walls, roof, glass, doors and building filters are properly installed.
 - 4. If air handlers must be used during construction, provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 at each air-handling unit. Provide specified prefilters and final filters for operation during construction or install temporary 4-inch MERV 8 filters at each return air grille for operation during construction.
 - 5. Replace all filtration media immediately prior to Substantial Completion.
 - a. Filtration media installed in air-handling units shall have a Minimum Efficiency Reporting Value (MERV) of 8.
 - 6. Do not perform Testing and Balancing until dust or odor generating activities are completed.

2.02 SOURCE CONTROL

- A. Minimize IAQ contaminants introduced by construction materials.
- B. Store waste construction materials a minimum of 30 feet away from the building.
- C. Do not smoke within 30 feet of the exterior building perimeter.

2.03 PATHWAY INTERRUPTION

- A. Provide barriers to contain construction areas to allow a portion of the building to be cleaned and then operate the HVAC system in that cleaned area. Acceptable barriers include dust curtains and temporary walls.
 - 1. Protect areas of the building in which HVAC is operational by physical barriers from areas of the building not acceptable for operation of the HVAC system.
- B. Maintain areas within 30 feet of outdoor air intakes free of dust, dirt, debris, and volatile materials while the HVAC system is in operation.

2.04 HOUSEKEEPING

- A. As dust accumulates at the Site, it can become airborne when disturbed by nearby activity. Similarly, spills or excess applications of products containing solvents will increase odors at the Site. Leaving the Site wet or damp for more than a day could result in the growth of mold and bacteria. Therefore, Site cleanup and maintenance is important to maintaining good IAQ during construction.
- B. Perform the following to control contaminants at the Site:
 - 1. Suppress dust with wetting agents or sweeping compounds.
 - 2. Provide an efficient dust collection method (e.g. a damp rag, wet mop, or vacuum equipped with a high efficiency particulate arrester (HEPA) filter or wet scrubber).
 - 3. Remove spills or excess applications of solvent-containing products immediately. Provide low-VOC emitting spot removers and cleaning agents near occupied areas.
 - 4. Remove accumulated water and keep work areas as dry as possible, including the use of dehumidification, if necessary.
 - 5. Once building is enclosed, vacuum with HEPA filtered vacuum cleaners to prevent settled dust from becoming airborne again.
 - 6. Protect porous materials from exposure to moisture. Replace items that remain damp for more than four hours.

END OF SECTION 018119

SECTION 018316
NFPA 285 EXTERIOR WALL ASSEMBLY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for providing exterior wall assemblies demonstrably in compliance with NFPA 285 testing requirements. Therefore, the Contractor shall be responsible for ensuring all exterior wall assemblies are in compliance with NFPA 285 if the Contractor proposes any exterior wall component not otherwise specified/indicated as part of the basis-of-design or comparable assemblies for *this* Project.
- B. NFPA 285 is an exterior wall *assembly* test (not a *component* test) specific to the component(s) tested and reported as part of that assembly. Therefore, compliance with NFPA 285 is required FOR ALL EXTERIOR WALL ASSEMBLIES, and documentation of compliant assemblies including all of the assembly's components is required to demonstrate compliance with the code requirements.
 - 1. Substituting any alternate exterior wall component is not acceptable without pre-approval from the authorities having jurisdiction (AHJ), or acceptable (to the AHJ and Architect) documentation (e.g., engineering judgment(s) or ICC-ES report(s)) demonstrating a passing assembly test with the proposed substituted product(s).
 - a. For example, if a substitution is submitted to revise the specified (basis of design) cavity insulation (or air barrier, or any other exterior wall component), said substituted cavity insulation must have been tested (and passed) in combination with all of the other provided exterior wall components.
 - 2. NFPA 285 is not a *component* test, so documentation claiming said component is "NFPA 285 compliant" shall not be acceptable, unless it can be demonstrated that said component is acceptable with the other required and provided exterior wall components.
- C. Exterior wall assemblies that must comply with NFPA 285 include those containing the following combustible components:
 - 1. Any foam plastic insulation, such as polystyrene, polyisocyanurate, and polyurethane foams. This includes cavity insulation, insulation installed within studs, and/or exterior insulation and finish systems (EIFS).
 - 2. Any combustible water-resistive barrier installed over 40 feet above the finish grade, such as felts, building wrap, and membrane or fluid-applied air barriers.
 - 3. Fiber-reinforced polymer (FRP) cladding without fireblocking, in excess of area limitations, or otherwise not meeting limitations or exceptions imposed by applicable building code.
 - 4. High-pressure decorative exterior-grade compact laminate (HPL) cladding installed over 40 feet above the finish grade or otherwise not meeting limitations imposed by the applicable building code.
 - 5. Metal composite material (MCM) cladding installed over 40 feet above the finish grade or otherwise not meeting limitations imposed by applicable building code.

1.02 DEFINITIONS

- A. Exterior Wall Assembly: For NFPA 285 compliance purposes, the exterior wall assembly is one that encloses interior spaces and does not include parapets, exterior "wing" walls, or site-related walls (e.g., retaining walls or screen walls).

- B. Basis-of-Design: For NFPA 285 compliance purposes, all exterior wall assemblies indicated in the Contract Documents shall be considered compliant, including specific basis-of-design components. Such basis-of-design assemblies are to establish a compliant NFPA 285 design and do not limit use of other acceptable manufacturers' comparable tested assemblies with comparable tested components.
- C. Comparable: For NFPA 285 compliance purposes, comparable assemblies, including specific comparable components, may be allowed. Such comparable components are meant to allow for alternative compliant NFPA 285 designs.
- D. Exterior Wall Assembly Component(s): Products which are a part of an exterior wall assembly, including, but may not be limited to: each type of veneer, foam plastic insulation, water-resistive barriers, air barriers, sheathing, flashings, blocking, lintels, and substrate construction (e.g., masonry and steel studs).

1.03 PERFORMANCE REQUIREMENTS

- A. Exterior Wall Assemblies: Shall comply with applicable "NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components."
 - 1. Although the title of the applicable test includes the text "Nonload-bearing," and the standard itself may include assembly descriptions such as curtain wall assemblies, be advised that the NFPA 285 test requirements apply to every exterior wall assembly on this Project.

1.04 ACTION SUBMITTALS

- A. Comparable NFPA 285 Exterior Wall Assemblies: Submit request for consideration for each proposed comparable exterior wall assembly or exterior wall assembly component to the AHJ for their approval PRIOR TO submitting to the Architect for their review. Identify each component required and, where there are options (e.g., documentation may indicate something like, "any gypsum wallboard at least 1/2 inch thick), each optional component proposed. Provide cross-reference to the basis-of-design assembly for each comparable assembly/component proposed to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Provide ICC-ES Report, Technical Evaluation Report, Material Test Report, engineering judgment, or other published data acceptable to AHJ to demonstrate proposed comparable exterior wall assembly (including all of the actual exterior wall components to be provided on this Project) has been tested or evaluated to comply with the NFPA 285 test requirement.
- B. Substitution Exterior Wall Assembly Component Requests: Submit request for consideration of each proposed substituted product in accordance with the Substitution requirements included in this Project Manual. Identify any and all products to be substituted. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Provide ICC-ES Report, Technical Evaluation Report, Material Test Report, engineering judgment, or other published data acceptable to AHJ to demonstrate proposed substituted exterior wall assembly (including all of the actual exterior wall components to be provided on this Project) has been tested or evaluated to comply with the NFPA 285 test requirement.
 - 2. Obtain and submit approval from the AHJ PRIOR TO SUBMITTING SUBSTITUTION for consideration by the Architect.

1.05 INFORMATIONAL SUBMITTALS (NO ACTION WILL BE TAKEN BY THE ARCHITECT)

- A. Basis-of-Design NFPA 285 Exterior Wall Assemblies: If the assembly(ies) to be provided on this Project is/are identical to the basis-of-design, in every way (components and detailing), "Action Submittals" shall not be required and only a certification from the Contractor indicating compliance is required. Identify each component product for the record.

1.06 COORDINATION AND TESTING

- A. Coordinate affected trades and construction to ensure compliance with the basis-of-design exterior wall assembly or documented NFPA 285 testing.
- B. If the basis-of-design, approved (by the AHJ and Architect) comparable, or approved (by the AHJ and Architect) substitution assemblies are not provided, submit the proposed alternative exterior wall assembly and component(s) for actual full NFPA 285 testing.
 - 1. Upon obtaining a passing NFPA 285 test, submit supporting documentation in accordance with "Action Submittals" herein.
 - 2. Submit for and provide a PASSING grade/test sufficiently in advance of operations and construction schedule as to not delay the Project.
 - 3. If such testing fails, submit/provide for additional testing until such time as the proposed alternative exterior wall assembly(ies) achieves a PASSING grade.
 - 4. Organize preconstruction meetings between the trades involved in the exterior wall assembly to discuss the implications of not providing the basis-of-design or approved comparable components and how compliant components will ultimately be incorporated into the exterior wall assembly, or to determine if testing will be required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXTERIOR WALL ASSEMBLY PRE-CONSTRUCTION CONFERENCE

- A. If the basis-of-design for all exterior wall assembly components are not provided:
 - 1. Review preliminary pre-construction checklist and guide included at the end of this Section for additional requirements for those components you plan on submitting that are NOT the basis-of-design.
 - 2. Conduct such pre-construction conference PRIOR TO submitting or procuring any exterior wall assembly component that is not the basis-of-design.

EXTERIOR WALL ASSEMBLY PRE-CONSTRUCTION CONFERENCE GUIDE

If the basis-of-design of the exterior wall assembly components are not provided, such exterior wall components will require the coordinated efforts of all of the exterior wall trades on the construction, design, and ultimate NFPA 285-compliant exterior wall assemblies of such components. If a NFPA 285 test is required (or multiple tests are required because of failing tests), such testing of the proposed exterior wall assembly will be costly and time-consuming.

Therefore, the Contractor and affected exterior wall subcontractors must have a working knowledge of the NFPA 285 test and shall work toward a common goal of achieving a compliant and pre-approved assembly.

Contractor may request an electronic version of this document for editing purposes, completion of this guide, and for its use.

Send a copy of this guide to the affected trades and/or attendees so they can come to the Conference prepared to discuss these topics and to fill in as much of this information as possible prior to the conference, or be prepared to fill in such information at the conference.

CHECKLIST:

Submit and/or complete the following prior to conducting the Pre-Construction Conference. Confirm any additional submittal requirements with the relevant specification sections. Check those items below that you have completed or received "Approved" submittals from the Architect. Delete those that do not apply.

- Product data Shop drawings Product Certificates
- Product test reports Installer qualifications Compatibility docs
- _____

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

REVIEW OF RELEVANT PROJECT CONTRACT SPECIFICATION SECTIONS:

Review the Contract Specifications and identify and note any products that may be necessary for compliance, so all parties understand what is required of them. Submit any substitutions in accordance with these Documents. Please note: Not all affected specification sections are indicated below – edit as necessary.

SPEC SECTION	PRODUCTS (IF ANY)
018316	
042000	
071113	
071326	
071413	
071416	
07241X	
072500	
072726	
072727	
074213	

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

REVIEW OF COMPONENTS / PRODUCTS:

Review and identify the components that will actually be provided on this Project. Delete those that do not apply.

COMPONENT	ACTUAL COMPONENT TO BE PROVIDED FOR PROJECT
FOAM PLASTIC INSULATION – FIELD OF WALL	
FOAM PLASTIC INSULATION – CAVITY	
FOAM PLASTIC INSULATION – STUDS	
FOAM PLASTIC INSULATION (WALL) – VOIDS / CRACKS / SHIMS	
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL	
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL	
SELF-ADHERED MEMBRANE – PERMEABLE - WALL	
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL	
TRANSITION MEMBRANE – SELF-ADHERED	
PRIMER	
MASTIC / TERMINATION SEALANT	
MCM – WALL	
HPL – WALL	
FRP - WALL	

**OTHER PRE-CONSTRUCTION NFPA 285 AND EXTERIOR WALL ASSEMBLY
CONSIDERATIONS AND COMMENTS:**

END OF EXTERIOR WALL ASSEMBLY PRE-CONSTRUCTION CONFERENCE GUIDE

END OF SECTION 018316

SECTION 018317
EXTERIOR BUILDING ENCLOSURE AIR BARRIER REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air, including but may not be limited to:
1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the exterior building enclosure shall be "the air barrier system."
 2. Coordinate between trades, schedule and sequence the Work, and provide preconstruction meetings, inspections, tests, and related actions.
 3. Reports performed by Contractor, independent agencies, and governing authorities.
 4. Construct the building enclosure with a continuous air barrier system to control air leakage into (infiltration) and out of (exfiltration) conditioned spaces. The air barrier system shall have the following characteristics:
 - a. Continuous, with all joints sealed.
 - b. Structurally supported to withstand positive and negative air pressures applied to the building enclosure.
 - c. Connections between:
 - 1) Foundation and walls.
 - 2) Walls and windows and doors.
 - 3) Different wall systems.
 - 4) Wall and roof.
 - 5) Walls, floors, and roofs across construction joints, control joints and expansion joints.
 - 6) Walls, floors and roofs to utility, pipe and duct penetrations.
 5. Make all penetrations of the air barrier membrane or system and paths of air infiltration / exfiltration air-tight.

1.02 RESPONSIBILITIES

- A. Contractor responsibilities:
1. Coordinate affected trades and sequence construction to ensure continuity of the air barrier system, joints, junctures, and transitions between materials and assemblies of materials and products, from substructure to walls to roof.
 - a. Coordinate the sequence of activities to accommodate required services with a minimum of delay.
 - b. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 2. Provide quality assurance procedures, testing and verification as required.
 - a. Schedule times for inspections, tests, taking samples, and similar activities.
 3. Facilitate inspections, tests, and other quality-control services required.
 - a. Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested.
 - b. Notify the agency sufficiently in advance of operations to permit assignment of personnel.
-

- c. Services include, but are not limited to, the following:
 - 1) Provide access to the Work.
 - 2) Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 - 3) Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 - 4) Deliver samples to testing laboratories.
 - 5) Provide security and protection of samples and test equipment at the Project Site.
- 4. Organize pre-installation conference and preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
- 5. Provide mockup of exterior wall assembly as required.
- 6. Coordinate the Work and trades to provide an airtight building enclosure.
 - a. Continuity of the air barrier materials and products with joints to provide assemblies.
 - b. Continuity of all exterior enclosure assemblies with joints and transition materials to provide an exterior enclosure air barrier system.
 - c. Specific quality-control requirements for individual construction activities are also indicated in other applicable sections of the specifications. Ensure each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each such section.
 - d. Inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
 - e. Requirements to provide an airtight exterior building enclosure is not limited by quality-control services performed by Architect, Owner, or authorities having jurisdiction and are not limited by provisions of this section.

1.03 PERFORMANCE REQUIREMENTS

- A. Materials: Used for the air barrier system in the opaque envelope shall have an air permeance not to exceed 0.004 cfm/ft² under a pressure differential of 0.3 in. water (1.57psf) (0.02 L/s.m² @ 75 Pa) when tested in accordance with ASTM E 2178.
- B. Assemblies of materials and components: Shall have an air permeance not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 in. water (1.57psf) (0.15 L/s.m² @ 75 Pa) when tested in accordance with ASTM E 2357.

1.04 SUBMITTALS

- A. Submit a written report of each inspection, test, or similar service performed by the air barrier manufacturer's technical representative, to the Owner, Architect, and Contractor.
 - 1. Report Data: Written reports of each inspection, test, or similar service shall include, but may not be limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.

- h. Complete inspection or test data.
- i. Test results and an interpretation of test results.
- j. Ambient conditions at the time of sample taking and testing.
- k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
- l. Name and signature of laboratory inspector.
- m. Recommendations on retesting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protect the Work, regardless of the assignment of responsibility for inspection, testing, or similar services.

AIR BARRIER SYSTEM PRE-INSTALLATION CONFERENCE GUIDE

PURPOSE:

Few building construction components require the coordinated activities of more different trades on the construction, design, and management teams than an air barrier system. Once an air barrier has been covered, any remedies for problems with the components or installation can be costly and time-consuming.

Contractor and subcontractors must have a working knowledge of the air barrier installation, proper sequencing, and must work toward a common goal. Through the use of the integrated mockup panel and this Pre-Installation Conference Guide, gaining such knowledge should be enhanced.

Source: Much of this checklist utilizes content from Tremco's "Air Barrier Project Management – Pre-Construction Meeting Checklist" document.

Contractor may request an electronic version of this document for editing purposes and for your use.

Send a copy of this guide to the affected trades and/or attendees so they can attend the Conference prepared to discuss these topics and to fill in as much of this information as possible prior to the meeting, or be prepared to fill them in at the meeting.

CHECKLIST:

Submit and/or complete the following prior to conducting the Pre-Installation Conference. Confirm any additional submittal requirements with the relevant specification sections. Check those items below that you have completed or received "Approved" submittals from the Architect. Delete those that do not apply.

- | | | |
|---|---|--|
| <input type="checkbox"/> Product data | <input type="checkbox"/> Shop drawings | <input type="checkbox"/> Product Certificates |
| <input type="checkbox"/> Product test reports | <input type="checkbox"/> Installer qualifications | <input type="checkbox"/> Samples |
| <input type="checkbox"/> Compatibility docs | <input type="checkbox"/> Integrated mockup | <input type="checkbox"/> Quality Assurance Program |
| <input type="checkbox"/> ABAA certifications | <input type="checkbox"/> Warranty sample | <input type="checkbox"/> _____ |
| <input type="checkbox"/> Air Barrier System Subcontractor reviewed submittals of other indicated/specified trade(s) | | |

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

MANDATORY ATTENDEES:

Attendance by the following parties and affected trades is mandatory. Identify and ensure any other trades or parties involved or affected by the installation of the air barrier system components are also present. Check those below who actually attend the meeting. Delete those that do not apply.

- | | |
|--|--|
| <input type="checkbox"/> Owner and/or Owner's representative | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Owner's Testing Agency (if hired to inspect ABS) | <input type="checkbox"/> Contractor |
| <input type="checkbox"/> Air barrier installer / subcontractor | <input type="checkbox"/> Masonry subcontractor |
| <input type="checkbox"/> Air barrier manufacturer's technical representative | <input type="checkbox"/> Roofing subcontractor |
| <input type="checkbox"/> Window opening subcontractor | <input type="checkbox"/> Sheathing subcontractor |
| <input type="checkbox"/> Exterior Insulation subcontractor | <input type="checkbox"/> Concrete subcontractor |
| <input type="checkbox"/> Exterior Metal Panel subcontractor | <input type="checkbox"/> CFSF-S subcontractor |
| <input type="checkbox"/> Steel frame (hollow metal) subcontractor | <input type="checkbox"/> Waterproofing subcontractor |
| _____ | _____ |

REVIEW OF RELEVANT PROJECT CONTRACT SPECIFICATION SECTIONS:

Review the Contract Specifications and identify and note any modifications that may be necessary, so all parties understand what is required of them. Submit any modifications via appropriate supplemental documents (FC or PCO). Edit specification sections below to match those of this Project.

SPEC SECTION	MODIFICATIONS (IF ANY)
018317	
072726	
072727	

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

REVIEW OF PRODUCTS:

Review the type of air barrier system that will be provided on the Project and identify each component. Delete those that do not apply.

COMPONENT	ACTUAL PRODUCT TO BE PROVIDED FOR PROJECT
SPF INSULATION – FIELD OF WALL	
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS	
SPF INSULATION – FIELD OF ROOF	
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL	
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL	
SELF-ADHERED MEMBRANE – PERMEABLE - WALL	
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL	
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF	
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF	
TRANSITION MEMBRANE – SELF-ADHERED	
PRIMER	
MASTIC / TERMINATION SEALANT	

CONSTRUCTION TIE-IN RESPONSIBILITY:

Air barrier systems are successful when a full building envelope/enclosure – without penetrations, voids, holes, gaps, and cracks – is complete. This is critical when numerous trades are involved in the tying-in of the air barrier system to all facets of the exterior building envelope. Utilize the table below to ensure everyone knows who is responsible for the indicated tie-in.

TIE-IN AREA	SUBCONTRACTOR RESPONSIBLE FOR TIE-IN
EXTERIOR FOOTING TO EXTERIOR FOUNDATION WALL	
EXTERIOR FOUNDATION TO EXTERIOR WALL	
SLAB-ON-GRADE TO WALL (EXTERIOR AND INTERIOR)	
SLAB-ON-GRADE JOINTS	
SLAB-ON-GRADE PENETRATIONS	
EXTERIOR WALL TO STEEL FRAME/HOLLOW METAL (E.G., DOORS AND WINDOWS)	
EXTERIOR WALLS TO ALUMINUM FRAMES (E.G., WINDOWS AND LOUVERS)	
DIFFERENT EXTERIOR WALL SYSTEMS (E.G., MASONRY TO METAL)	
EXTERIOR HEAD-OF-WALL TO SLOPING ROOF	
PARAPET WALLS TO ROOF	
EXTERIOR WALL JOINTS	
EXTERIOR SHELF ANGLES	
EXTERIOR STEEL LINTELS	
EXTERIOR WALL PENETRATIONS (E.G., PIPES, DUCTS)	
ROOF PENETRATIONS	
ROOF PERIMETER	

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No.: 631310

COMPATIBILITY REVIEW:

Each trade/installer shall identify materials that may have potential compatibility issues. For example, some membranes may be subject to decomposing when placed in contact with other materials or components, especially sealants and primers; or may deteriorate if left exposed to the elements and are not protected. Delete those trades/installers that do not apply to this Project.

TRADE / INSTALLER	ISSUES / RESOLUTIONS
AIR BARRIER	
WINDOW	
STEEL FRAME (HOLLOW METAL)	
CFSF-S	
EXTERIOR METAL PANELS	
WATERPROOFING	
MASONRY	
ROOFING	
SHEATHING	
CONCRETE	
INSULATION	
FLEXIBLE FLASHING	
METAL FLASHING	
STRUCTURAL STEEL	

SUBSTRATE PRIMER CONSIDERATIONS:

Indicate whether the substrate for the air barrier material requires the use of a primer, and if so, identify the actual product to be used on the Project. Delete those that do not apply.

SUBSTRATE	YES	NO	PRODUCT
CMU			
SHEATHING			
CONCRETE			
PRECAST			
METAL PANELS			
ROOF SUBSTRATE BOARD			
FLEXIBLE FLASHING			
METAL FLASHING			
WATERPROOFING			
STEEL FRAME / HOLLOW METAL			
STRUCTURAL STEEL			

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

SUBSTRATE PREPARATION CONSIDERATIONS:

Indicate whether the substrate for the air barrier material requires special treatment or preparation (e.g., flush joints in CMU), and if so, identify the method to be used on the Project. Delete those that do not apply.

SUBSTRATE	YES	NO	METHOD / PROCEDURE	SUBCONTRACTOR RESPONSIBLE
CMU				
SHEATHING				
CONCRETE				
PRECAST				
METAL PANELS				
ROOF SUBSTRATE BOARD				
WINDOW FRAMES				
FLEXIBLE FLASHING				
METAL FLASHING				
WATERPROOFING				
STEEL FRAME / HOLLOW METAL				
STRUCTURAL STEEL				

JOINT CONSIDERATIONS:

It is critical for all joints, gaps, voids, cracks, seams, etc. to be sealed/closed for the air barrier to function properly (based on air barrier manufacturer's instructions). If applicable, indicate the method to be used to close the joints and who is responsible. Delete those that do not apply.

TYPE OF JOINT	METHOD USED TO CLOSE JOINT	SUBCONTRACTOR RESPONSIBLE
CMU		
SHEATHING		
CONCRETE		
PRECAST		
METAL PANELS		
ROOF SUBSTRATE BOARD		
WINDOW FRAMES		
STEEL (HOLLOW METAL) FRAMES		
HEAD-OF-WALL		
OMITTED CMU BLOCK		

INSTALLATION TEMPERATURES:

A major factor in contributing to a successful air barrier system installation is to monitor and install the components within the proper temperature ranges and weather conditions. Indicate below the proper temperature range for each component; the procedure for maintaining the proper temperature range; and the party responsible for maintaining the proper temperature range in accordance with the requirements. Delete those that do not apply.

COMPONENT	PROPER TEMPERATURE RANGE	PROCEDURE AND SUBCONTRACTOR RESPONSIBLE
SPF INSULATION – FIELD OF WALL		
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS		
SPF INSULATION – FIELD OF ROOF		
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL		
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - WALL		
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF		
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF		
TRANSITION MEMBRANE – SELF-ADHERED		
PRIMER		
MASTIC / TERMINATION SEALANT		

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

AIR BARRIER PROTECTION:

The air barrier system shall be protected during construction. Indicate below how the components will be protected (method used), by whom, and when. Delete those that do not apply.

COMPONENT	METHOD USED FOR PROTECTION	SUBCONTRACTOR	WHEN
SPF INSULATION – FIELD OF WALL			
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS			
SPF INSULATION – FIELD OF ROOF			
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL			
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL			
SELF-ADHERED MEMBRANE – PERMEABLE - WALL			
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL			
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF			
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF			
TRANSITION MEMBRANE – SELF-ADHERED			
PRIMER			
MASTIC / TERMINATION SEALANT			

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

AIR BARRIER REPAIR:

Discuss how any damage, including but not limited to, accidental holes in the air barrier system, will be repaired – and by whom. Indicate the actual product to be used to perform any repairs in the air barrier components. Delete those that do not apply.

COMPONENT	PRODUCT TO BE USED FOR REPAIR	SUBCONTRACTOR RESPONSIBLE
SPF INSULATION – FIELD OF WALL		
SPF INSULATION (WALL) – VOIDS / CRACKS / SHIMS		
SPF INSULATION – FIELD OF ROOF		
FLUID-APPLIED MEMBRANE – PERMEABLE - WALL		
FLUID-APPLIED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - WALL		
SELF-ADHERED MEMBRANE – IMPERMEABLE -WALL		
SELF-ADHERED MEMBRANE – PERMEABLE - ROOF		
SELF-ADHERED MEMBRANE – IMPERMEABLE -ROOF		
TRANSITION MEMBRANE – SELF-ADHERED		
PRIMER		
MASTIC / TERMINATION SEALANT		

INSULATION SECURED TO OR OVER AIR BARRIER MATERIAL:

Address any concerns or issues of installing insulation over the air barrier material (foundation, walls, and roof), such as preparation, securing, or fastening methods. Delete those that do not apply.

INSULATION TYPE	METHOD FOR SECUREMENT	CONCERNS (IF ANY)
SPF		
XPS		
POLYISO		
EPS		
EPX		

CFSF-S LOCATIONS: DELETE IF THEY DO NOT APPLY.

Where CFSF-S is a component in the exterior wall assembly, the air barrier installer may need to mark the material itself to indicate where the framing is located. The insulation subcontractor, in turn (when the insulation is not the air barrier), may need to transfer those marks onto the insulation. If any of the above is required, discuss and identify below. Delete those that do not apply.

COMPONENT	SUBCONTRACTOR RESPONSIBLE FOR LOCATION MARKS, IF NECESSARY
SHEATHING	
AIR BARRIER	
INSULATION	

OTHER CONSIDERATIONS OR COMMENTS:

END OF AIR BARRIER SYSTEM PRE-INSTALLATION CONFERENCE GUIDE

END OF SECTION 018317

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meet defined objectives and criteria. The commissioning process includes specific tasks to be conducted during construction to verify that construction is performed in accordance with contract requirements, equipment installations provide adequate service access, systems perform in accordance with design intent, and training meets the Owner's requirements.
- B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

1.2 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this section.

1.3 COMMISSIONING TEAM

- A. Commissioning Team: The members of the commissioning team consist of:
 - 1. The Owner's representative (OR)
 - 2. The commissioning authority (CxA)
 - 3. The architect and design engineers (AE)
 - 4. The Contractor aka general contractor (GC)
 - 5. The mechanical/ plumbing contractor (MC)
 - 6. The testing and balancing contractor (TAB)
 - 7. The electrical contractor (EC)
 - 10. The Automatic Temperature Controls contractor (ATC)
 - 11. The Owner's facility operating and maintenance staff
 - 12. Other installing subcontractors
 - 13. Equipment suppliers and manufacturer's representatives
- B. The CxA directs and coordinates the project commissioning activities and reports to the Owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

1.4 SCOPE

- A. This section provides the general requirements that apply to the implementation of the commissioning process. In general, the following components, assemblies, and systems shall be commissioned:
 - a. Air-Cooled Chillers
 - b. Boilers
 - c. Pumps
 - d. Air Handling Units

- e. HVAC controls
- f. Kitchen Make-up air unit
- g. Ductless split-system units
- h. Terminal heaters (unit, ceiling, baseboard)
- i. Fan Coil Units
- j. Blower Coil Units
- k. Fans
- l. Domestic Hot Water System
- m. Lighting Control System

1.5 COORDINATION

- A. Project Commissioning Team: The members of the project commissioning team shall consist of the commissioning authority and any support personnel, the Owner's facility staff, the Contractor, subcontractors and/or vendors as required, and the Architect/Engineer.
- B. Management: The CxA coordinates the commissioning activities through the Contractor. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
- C. Scheduling: The CxA shall provide sufficient information to the Contractor for required commissioning activities. The Contractor shall integrate all commissioning activities into the overall project schedule. All parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.6 PROCESS

- A. The following is a brief overview of the typical commissioning tasks during and after construction and the general order in which they occur.
 - 1. Commissioning during construction begins with an initial commissioning meeting conducted by the CxA where the commissioning process is reviewed with the project commissioning team members.
 - 2. Additional meetings shall be required throughout construction, scheduled by the CxA, through the Owner and GC, with necessary parties attending to plan, scope, coordinate, schedule future activities and resolve problems.
 - 3. Equipment documentation is submitted to the CxA, through the Owner and GC, during normal submittals, including detailed startup procedures.
 - 4. The pre-functional checklists are to be completed by the Contractor and its subcontractors throughout the construction installation and during the startup process.
 - 5. Pre-functional checklists and equipment startup must be completed before systems performance verification. Additionally, testing and balancing and automation system trending must be completed before HVAC systems performance verification can occur.
 - 6. The Contractor ensures that the subcontractors' construction checklists are executed and documented, and that startup and initial checkout are performed. The CxA verifies that the Testing and Balancing (TAB), construction checklists and startup were completed

according to Contract requirements.

7. The CxA develops and implements equipment and system performance verification procedures. The performance verification tests are executed by the Contractor under the direction of the CxA with participation of the facility staff.
 8. Issues discerned during construction, start-up, or performance verification shall be documented by the CxA. Rectification of issues resides with the Contractor or AE.
 9. The CxA reviews the O&M documentation for completeness and pertinence; and participates in Contractor's instructions and training of Owner's operating and maintenance personnel.
- B. Other than deferred seasonal performance verification of HVAC systems, all equipment/systems commissioning, including all Owner training, shall be completed before Substantial Completion.

1.7 RESPONSIBILITIES

A. All Parties

1. Follow the Commissioning Plan.
2. Attend initial commissioning meeting and additional meetings, as necessary.

B. Owner's Representative (OR)

1. Facilitate the coordination of the commissioning work by the CxA, and, with the GC and CxA, ensure that commissioning activities are being scheduled into the master schedule.
2. Attend a commissioning scoping meeting and other commissioning team meetings.
3. Furnish a copy of all construction documents, addenda, and Change documents.
4. At Owner's option, review any performance test procedures submitted by the CxA.
5. At Owner's option, observe and witness startup and performance testing of selected equipment.
6. Review commissioning progress and deficiency reports. Work to resolve CxA-cited non-compliance issues and deficiencies.
7. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities and Contractor's instructions and training.
8. Assist the CxA as necessary in the seasonal or deferred performance verification and deficiency corrections required by the specifications.
9. Acknowledge completion of commissioning process.

C. Architect/Engineer (AE)

1. Architect: In addition to performing its contractual construction contract administration functions, Architect shall:
 - a. Attend initial commissioning meeting and selected commissioning team meetings.
 - b. Coordinate CxA review and approval of Contractor-submitted submittals and shop drawings related to commissioned equipment. Architect shall forward a set of relevant documents at time of receipt A/E shall coordinate receipt of CxA review documents within fourteen (14) days of receipt and shall incorporate any CxA comments into the

- submittals and shop drawings returned to the Contractor.
- c. Provide any design documentation requested by the CxA.
 - d. Coordinate with OR to assure that the CxA is:
 - 1) Provided copies of approved shop drawings as they are returned to the Contractor.
 - 2) Notified of time, date, and place of all regularly scheduled progress meetings, and of any special meetings that may be called regarding commissioned systems.
 - 3) Copied on all correspondence pertinent to the commissioned systems including but not limited to minutes of progress meetings, responses to Contractor requests for information and Change documentation.
 - e. Coordinate resolution of cited deficiencies (as appropriate).
2. Engineers: In addition to performing its contractual construction contract administration functions of submittals review, site visits, O&M manuals and As-Built documents review, engineers shall:
- a. Attend initial commissioning meeting and other selected commissioning team meetings.
 - b. Provide any design narrative and sequences documentation requested by the CxA. Assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings, or equipment documentation is not sufficient for writing performance verification procedures.
 - c. Participate in the resolution of cited deficiencies (as appropriate).
- D. Contractors (GC)

General Contractor, subcontractors, and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning activities including, but not limited to, the following:

1. Provide the Commissioning Authority with a list of team members (including member's name, contract affiliation, title, responsibility, phone, email, and mailing address) who will represent the Installing Contractors in pre-functional checks and functional performance verification. Submit no later than at the Pre-Commissioning Meeting.
2. Assure that the Commissioning Authority is provided with all relevant correspondence, submittals, notifications, and assistance as may be required to satisfactorily complete the commissioning process using whatever personnel, time and resources that are required.
3. Facilitate the coordination of commissioning and incorporate commissioning milestones and activities into the project schedule. The Contractor shall coordinate with the Subcontractors to provide adequate time to accommodate all commissioning activities including the witnessing of milestone events, equipment start-ups, Owner training, Operating and Maintenance Manuals review and all other activities requiring scheduled participation of the Commissioning Authority as defined in the pre-functional checks and functional performance verification forms.
4. Provide detailed startup procedures for all commissioned equipment/systems.
5. Include in his Contract Sum the cost of furnishing the material requested and manpower necessary for the verification of proper system installation and operation as specified in this Section.

6. Attend initial commissioning meeting and other selected commissioning team meetings.
 7. Provide notification of an impending event to the Commissioning Authority at least 48 hours in advance, notification may be by telephone or email. The 48-hour notice is acceptable if the event is accurately scheduled on the most current Construction Schedule. Events not accurately identified in the Construction Schedule shall require one-week notice.
 8. Provide the training of Owner personnel prior to Substantial Completion. Training plan shall be submitted for approval at least four weeks prior to first training session. Approved O&M manuals must be employed in training.
 9. Provide equipment/systems performance verification under CxA direction, including for seasonal or deferred verification. The contractors shall provide all tools or the use of tools to start, check-out and test equipment and systems. Evaluate performance deficiencies and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 10. Additional Information
 - a. The Contractor may receive a written request from the Commissioning Authority requesting specific information needed about each piece of commissioned equipment or system.
 - b. Typically this request for specific information shall include: detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures; full details of any Owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, copies of the installation and checkout materials shipped with the equipment and the actual field checkout sheet forms used by the factory or field technicians shall be submitted to the Commissioning Authority.
 - c. The Commissioning Authority may request further documentation deemed necessary for the commissioning process. These data requests may be made prior to the normal submittal process.
 11. Contractor's responsibility to have no deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority's review.
- E. Commissioning Authority (CxA)
1. Coordinates and directs the commissioning activities in a logical, sequential, and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
 2. Coordinate the commissioning work and, with the GC and OR, help integrate commissioning activities into the master schedule.
 3. Revise the Construction Phase Commissioning Plan, as necessary.
 4. Plan and conduct an initial commissioning meeting and other commissioning meetings as required.
 5. Request and review additional information from the Contractor required to perform commissioning tasks, including O&M materials, Contractor startup and checkout

procedures.

6. Review AE approved Contractor submittals applicable to systems being commissioned for compliance with commissioning needs.
7. Write and distribute construction pre-functional checklists. Monitor execution of checklists during construction and provide approval when warranted.
8. Perform site visits, as necessary, to observe component and system installations. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving discrepancies.
9. Witness and document milestone events such as equipment start-ups.
10. Recommend approval of systems startup by reviewing startup reports and by selected site observation.
11. With necessary assistance and review from AE, Contractor, installing contractors, and vendors; write the performance verification procedures for equipment and systems. Analyze any performance trend logs and monitoring data to verify performance. Direct, coordinate, and/or witness equipment/systems performance verification and recommend approval. Coordinate retesting as necessary until satisfactory performance is achieved.
12. Maintain a master Issues Log. Provide the Owner with written progress reports and test results with recommended actions.
13. Witness performance testing of commissioned systems.
14. Witness and participate in the Contractor's training of the Owner's operating personnel.
15. Review/approve the O&M manuals.
16. Provide a final commissioning report that includes an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, a general description of testing and verification methods and all required commissioning task deliverables.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

- 3.1 SEQUENCING AND SCHEDULING: Systems commissioning may be construed to be in three parts: installation verification, training and demonstrations, and performance verification.
 - A. Installation verification utilizes Pre-Functional Check Lists, documenting that equipment/systems are installed per Contract Documents, are serviceable, and are started in accordance with Contract requirements and/or manufacturers' recommendations.
 - B. Contractor's training of and demonstrations for Owner's operating and maintenance personnel occurs after Pre-Functional Checks are complete and all test and inspection reports and operation and maintenance manuals have been submitted and approved. Training and demonstrations usually precede Performance Verification; some training, such as use and operations of the automation system, occurs during and after performance verifications.
 - C. Performance verification employs Functional Performance Verification forms and occurs only after all work required in related Sections has been successfully completed. HVAC systems require functional performance verification in distinct heating and cooling seasons, i.e. a minimum of two sessions of performance verification.

3.2 MEETINGS:

- A. Initial Meeting. Within 120 days of contractor bid award, CxA shall schedule an initial commissioning meeting. All commissioning parties are required to attend. CxA shall issue an agenda and chair the meeting. General content of the meeting will be for the CxA to provide an overview of the commissioning process for the project and to establish lines of communications.
- B. Miscellaneous Meetings. Other meetings may be planned and conducted by the CxA as construction progresses to address coordination, deficiency resolution, and planning issues.

3.3 SUBMITTALS

- A. The CxA shall review the Contractor's submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance verification procedures and only secondarily to verify compliance with equipment specifications. The CxA shall notify the Owner, and/ AE of items missing or areas that are not in conformance with Contract Documents.
- B. The CxA may request additional submittal documentation to facilitate the commissioning work. These requests may entail manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance test procedures, control drawings and details of Owner contracted tests. All documentation requested by the CxA shall be included by the subcontractors in the O&M manuals.

3.4 CONSTRUCTION CHECKLISTS AND START-UP

- A. Pre-Functional checklists are employed to verify that the equipment and systems are fully connected and operational. Installation elements of the checklists for a given system must be successfully completed and approved prior to startup. Contractors assert completion of installations. CxA verifies contractors' assertions.
- B. Equipment startups are performed by responsible contractors and/or factory authorized technicians as required by pertinent specification sections. The primary role of the CxA in the start-up process is to ensure that there is written documentation that each of the specified start-up requirements or the manufacturer-recommended procedures has been completed. Successful start-ups shall be documented on the Pre-Functional Checklists.
- C. Execution of Pre-Functional Checklists and Startup
 - 1. The pre-functional checklists shall be provided by the CxA. The pre-functional checklists may be revised in response to approved submittals.
 - 2. The Contractor shall maintain on site the pre-functional checklists, organized by system and by subsystem. Entries shall be made on the checklists no less than weekly and/or as items are completed.
 - 3. The execution and approval of the pre-functional checklist and startup shall be directed and performed by the Contractor, subcontractor, or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.
 - 4. The Contractor/subcontractor responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists and document the successful start-up. CxA shall witness startups and verify successful startup documentation.

5. The Contractor shall coordinate startup and checkout with the Owner, AE, and CxA. In general, startup of all major pieces of equipment shall be witnessed; a sampling strategy shall be used for witnessing startup of multiple similar pieces of equipment.

D. Issues, Non-Conformance, and Approval in Checklists and Startup (Issues Log).

1. During the commissioning process, the Commissioning Authority may identify issues that require corrective action. The Commissioning Authority has no authority to dictate ways and means of issues resolution other than enforcing the dictates of Contract Drawings and Specifications. Resolution of issues that require interpretations or modifications to the Contract Documents shall be the responsibility of the Architect and Owner.
2. Written responses shall be made to issues reported by the Commissioning Authority. The Commissioning Authority shall provide status reports and issues logs as deemed appropriate during the commissioning process with original provided to Owner and copies to the General Contractor, and Architect. The General Contractor and/or Architect shall provide the Owner with a written response to each issue cited by the Commissioning Authority as to corrective actions implemented. The written response shall be provided to the Owner within a minimum of two (2) weeks of the date of the Commissioning Authority's issues citing correspondence (or earlier as required by the project schedule); copies shall be provided to the Commissioning Authority, General Contractor, and Architect. Issues that have not been fully resolved within the two-week period shall be noted as such with explanation of intended resolution; and subsequent status reports of the continued issue resolution shall be made in writing at two week intervals until such time as the issue has been fully rectified. The Owner reserves the right to withhold partial payment for construction contract or professional services until satisfactory resolution of commissioning issues have been documented and verified.

3.5 COMMISSIONING REPORTS

- A. The Commissioning Authority shall document commissioning milestones with reports. The documents shall acknowledge acceptance at the milestone or separately list issues observed or discovered requiring correction. The document shall be distributed to Commissioning Team members.

3.6 OPERATIONS AND MAINTENANCE MANUALS

- A. The commissioning process requires detailed O&M documentation as identified in this section, Section 017823, and technical specifications.
- B. Operating and Maintenance Manuals shall be provided to the Architect/Engineer for review no later than the completion date of equipment placement or a minimum of eight (8) weeks before requesting inspection for substantial completion. AE shall provide the Operating and Maintenance Manuals to the Commissioning Authority after the AE's review. The Manuals with AE and Commissioning Authority's review comments shall be returned to the Contractor for preparation for use in training of Owner's operating and maintenance personnel. Return of the reviewed Manuals shall be approximately six weeks after Contractor submission.
- C. Manuals format and content shall be as specified in Section 017823.

3.7 DEMONSTRATIONS AND TRAINING

- A. The Contractor shall provide demonstrations and training in accordance with Section 017900 and technical specification sections.
- B. Demonstration and training plan shall be submitted to the Commissioning Authority at the

time of submission of the Operation and Maintenance Manuals. Plan shall fully detail all demonstrations and training that is to be provided by the Contractor to the Owner's operating and maintenance personnel and include a time allocation schedule. Actual dates and times, if used, shall be understood as tentative and subject to change based upon actual construction progress. However, at a minimum, the Demonstration and Training schedule shall include time allocations (i.e. hours) for each piece of equipment or system for which demonstration and training are specified. Commissioning Authority review comments shall be provided when Operating and Maintenance Manuals are returned to the Contractor. The plan shall, as a minimum, cover the following elements:

1. Equipment/system
 2. Intended audience
 3. Location of training
 4. Subjects covered (description, duration of discussion, special methods, etc.)
 5. Methods of training (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.).
- C. The approved O&M manuals shall be incorporated into all training sessions.
1. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
 2. Review the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal change-over and any emergency procedures.
 3. Discussion of relevant health and safety issues and concerns.
 4. Discussion of warranties and guarantees.
 5. Common troubleshooting problems and solutions.
 6. Discussion of any peculiarities of equipment installation or operation.
- D. The majority of training and demonstrations shall precede Performance Verification; some training, such as use and operations of the automation system, occurs during and after performance verifications. All training shall occur before Substantial Completion.
- E. The CxA participation in demonstration and training is largely observational, verifying that training has given to the satisfaction of Owner's operating and maintenance personnel. The CxA may amplify the training sessions by explaining design concepts and systems interactions.

3.8 PERFORMANCE VERIFICATION

- A. Requirements: Performance verification shall demonstrate that each system is operating according to the design intent and Contract Documents. Performance verification facilitates bringing the systems from a state of individual substantial completion to full dynamic operation. All major systems, such as large air handling units, etc. shall have performances verified by the CxA. Systems involving multiple, repeated equipment, such as VAV terminals, fan coil units, room lighting control, shall be verified by sampling.
- B. Coordination and Scheduling: The Contractor shall provide sufficient notice, regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems

to allow the performance verification to be scheduled and conducted before Substantial Completion. The commissioning team shall oversee, witness, and document the performance all equipment and systems. The CxA in association with the Contractor/subcontractors and facility staff shall execute the verifications.

1. Performance verification shall be conducted after the pre-functional checklists and startup has been satisfactorily completed.
 2. Two weeks prior to scheduled start of functional performance verification, the Contractor shall provide the Commissioning Authority with a comprehensive report asserting that systems are ready for functional performance verification. The report shall include the following materials:
 - a. Detailed descriptions of any deviations from the Contract Documents (including but not limited to change orders, addenda, and field changes) organized by system and by subsystem.
 - b. Complete set of as-built drawings and documents, clearly identifying all deviations from the Contract Documents and organized by system and by subsystem.
 - c. Complete set of all required manufacturer's equipment tests organized by system and by subsystem.
 - d. Completed pre-functional checklists, organized by system and by subsystem.
 - e. Results of any failed tests and detailed description of corrective actions taken, organized by system and by subsystem.
 3. For HVAC systems, air balancing and water balancing shall be completed, and all systems shall be satisfactorily operating under automation system control programming (automatic control) prior to performance verification.
 4. Performance verification proceeds from components to sub-systems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems shall be verified.
- C. Procedures. CxA shall provide detailed performance verification procedures and forms after all submittals, including controls, have been approved. Equipment performance shall be tested or verified per the parameters and requirements of the pertinent technical specifications and/or manufacturers' recommendations. Systems performances shall be verified per procedures of pertinent technical specifications, including Testing and Balancing of Division 01, and as further amplified by the CxA.
1. Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA may substitute specified methods or require an additional method to be executed other than what was specified, with the approval of the AE and Owner. The CxA shall determine which method is most appropriate for tests that do not have a specified method.
 2. Performance verification and testing shall be performed under design conditions as closely as is practically possible. Simulation of design conditions may be employed to verify performance. When simulation is used, the actual results may also require re-verification under design load conditions.
 3. The Installing Contractor shall operate all equipment and systems in support of the commissioning work effort and shall provide all labor, equipment, and materials necessary

to allow operational and performance verification of all commissioned equipment and systems.

D. Non-Conformance.

1. Corrections of minor deficiencies identified may be made during performance verification at the discretion of the CxA. In such cases the deficiency and resolution shall be documented on the procedure form or on an attached sheet.
2. As tests progress and a deficiency is identified that cannot be immediately rectified, the CxA shall discuss the issue with the commissioning team:
 - a. When there is no dispute on the issue and the Contractor accepts responsibility to correct it, the CxA shall document the issue in the Issues Log. After the Contractor acknowledges correction of the deficiency in writing in the Issues Log, the Contractor shall reschedule the test; and the test shall be repeated.
 - b. If there is a dispute about an issue, regarding whether it is a Contractor issue or a design issue:
 - 1) The apparent issue shall be documented in the Issues Log.
 - 2) The Owner shall determine the responsible party and the responsible party shall indicate the resolution on the Issues Log and the performance verification shall be repeated responsive to the resolution.
3. The Contractor shall acknowledge in writing the status of each outstanding issue identified in the Issues Log. A maximum two week time interval shall be allowed between the date of issuance of the Issues Log and the Contractor's resolution of deficiency and its response; however a faster Contractor correction and/or response shall be required as necessary to maintain the project schedule and not delay project completion. When deficiencies have not been rectified within the allotted two weeks, Contractor's response shall provide explanations.
4. Failure Due to Manufacturer Defect: If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform in accordance with the Contract Documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the Owner, AE or CxA. In such case, the Contractor shall provide the Owner with the following:
 - a. The Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be signed and dated, written explanation of the problem, cause of failures, etc., and all proposed solutions.
 - b. The Owner shall determine whether a repair is acceptable or whether a replacement of all identical units is required.
 - c. Performance verification shall be repeated after all repairs/replacements have been completed.

E. Deferred Performance Verification

1. Unforeseen Deferred Tests. If any check or test cannot be completed due to the project completion level or required occupancy condition, execution of checklists and performance verification may be delayed upon approval of the CxA and Owner. These tests shall be conducted in the same manner as originally required as soon as possible.

2. Seasonal Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity through the Owner. Tests shall be executed, documented by the CxA and deficiencies should be corrected by the appropriate Contractor/ subcontractors with the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing shall be made by the Contractor.
 - F. Costs for Re-Testing: Contractor is responsible for costs of performance verification. The cost of the work of the CxA is covered by the Owner. However, where re-testing of a system is required due to a deficiency having been cited and the re-test again fails due to un-rectified deficiencies, the costs of the CxA associated with all subsequent re-testing may be withheld from Owner's payment to the Contractor. Required retesting shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- 3.9 RECOMMENDED ACCEPTANCE: The CxA notes each satisfactorily demonstrated function on the performance verification forms. CxA provides all forms in final commissioning manual delivered to the Owner with an executive summary recommending acceptance of the installation as complete and operating in accordance with contract requirements. Recommendation of acceptance may be conditional where:
- A. The vast majority of the work was found to be installed and operating per Contract requirements, but some minor deficiencies remain. Final acceptance would be predicated upon the condition that all known issues have been corrected and accepted by the Owner.
 - B. The HVAC system may be conditionally accepted in the initial season of operation, with the condition that the operations in the opposite season must meet performance verification. Final acceptance of the HVAC system requires two-season (i.e. heating season and cooling season) performance verification.

END OF SECTION 019113

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES (SITE)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest & Paper Association:

1. AF&PA - National Design Specification (NDS) for Wood Construction.

C. APA - The Engineered Wood Association:

1. APA/EWA PS 1 - Voluntary Product Standard - Structural Plywood.

D. ASTM International:

1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

E. West Coast Lumber Inspection Bureau:

1. WCLIB - Standard No. 17 Grading Rules for West Coast Lumber.

1.3 COORDINATION

- A. Section 013000 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with other Sections of Work in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1.4 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Indicate:
 - a. Formwork, shoring, and reshoring.
 - b. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
 - c. Means of leakage prevention for concrete exposed to view in finished construction.
 - d. Sequence and timing of erection and stripping, assumed compressive strength at time of stripping, height of lift, and height of drop during placement.
 - e. Vertical, horizontal, and special loads according to ACI 347, and camber diagrams when applicable.
 - f. Notes to formwork erector showing size and location of conduits and piping embedded in concrete according to ACI 318.
 - g. Procedure and schedule for removal of shores and installation and removal of reshores.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Information Submittals: Delegated Design Submittals:
 - 1. Submit signed and sealed Shop Drawings with design calculations and assumptions for formwork, shoring, and reshores, as required and in conformance with authorities having jurisdiction.
 - 2. Include structural calculations to support design.
- E. Field Quality-Control Submittals: Indicate results of CONTRACTOR-furnished tests and inspections.

1.5 QUALITY ASSURANCE

- A. Perform Work according to ACI 301, ACI 318, and ACI 347.
- B. For wood products furnished for Work of this Section, comply with AF&PA.
- C. Perform Work according to State and local standards.

1.6 QUALIFICATIONS

- A. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of which the work is commencing.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Store materials off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Design, engineer, and construct formwork, shoring, and bracing according to ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

2.2 WOOD FORM MATERIALS

- A. Form Materials: At discretion of CONTRACTOR. Use forms of such section and design that they will adequately support the concrete and the construction equipment.

B. Lumber Forms:

- 1. Applications: Edge forms and unexposed finish concrete.
- 2. Boards:
 - a. Description:
 - 1) Shiplapped or tongue and groove.
 - 2) Surface boards on four sides.
 - b. Material: "Standard" grade Douglas fir according to WCLIB Standard No. 17.
 - c. Width: [6] [8] inches.

C. Plywood Forms:

- 1. Application: Exposed finish concrete.
- 2. Description:
 - a. Comply with APA/EWA PS 1.
 - b. Panels: Full size, 4 by 8 feet.
 - c. Label each panel with grade trademark of APA/EWA.
- 3. Plywood with "Smooth Finish" Indicated on Drawings:
 - a. Minimum Thickness: 3/4 inch.
 - b. Grade: APA/EWA "HD Overlay Plyform Structural I Exterior."

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

2.3 PREFABRICATED FORMS

- A. Furnish materials according to the prevailing jurisdiction standards.
- B. Preformed Steel Forms:
 - 1. Description: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
 - 2. Minimum Thickness: 16 gage.
- C. FRP Forms: Matched, tightly fitted, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- D. Steel Forms:
 - 1. Description: Sheet steel, suitably reinforced.
 - 2. Design: For particular use as indicated on Drawings.
- E. Form Liners: Smooth, durable, grainless, and non-staining hardboard unless otherwise indicated on Drawings.

2.4 COATINGS

- A. Coatings for Aluminum:
 - 1. Polyamide epoxy finish coat with paint manufacturer's recommended primer for aluminum substrate.
 - 2. One coat primer and one coat finish.
 - 3. Minimum Total Dry Film Thickness: in accordance with manufacturer recommendations. mils.

2.5 FORMWORK ACCESSORIES

- A. Form Ties:
 - 1. Type: Removable or Snap off.
 - 2. Material: Galvanized.
 - 3. Length: Adjustable.
 - 4. Free of defects capable of leaving holes larger than 1 inch in concrete surface.
- B. Spreaders:
 - 1. Description: Standard, non-corrosive metal-form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face.
 - 2. Wire ties, wood spreaders, or through bolts are not permitted.
- C. Form Release Agent:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1. Description: Colorless mineral oil that will not stain concrete or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- D. Corners:
1. Type: Chamfer.
 2. Size: as indicated on the drawing in inches.
- E. Bituminous Joint Filler: Comply with ASTM D1751.
- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength, and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify lines, levels, and centers before proceeding with formwork.
- C. Verify that dimensions agree with Drawings and Shop Drawings.
- D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from ENGINEER before proceeding.

3.2 INSTALLATION

- A. Earth Forms (may only be used for non-exposed areas):
 1. Trench earth forms neatly, accurately, and at least 2 inches wider than footing widths indicated on Drawings.
 2. Trim sides and bottom of earth forms.
 3. Construct wood edge strips at top of each side of trench to secure reinforcing and to prevent trench from sloughing.
 4. Form sides of footings where earth sloughs.
 5. Tamp earth forms firm and clear them of debris and loose material before depositing concrete.
- B. Formwork:
 1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

3. Camber forms where necessary to produce level finished soffits unless indicated otherwise on Drawings.
4. Positioning:
 - a. Carefully verify horizontal and vertical positions of forms.
 - b. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.
6. Erect formwork, shoring, and bracing to achieve design requirements according to ACI 318.
7. Stripping:
 - a. Arrange and assemble formwork to permit dismantling and stripping.
 - b. Do not damage concrete during stripping.
 - c. Permit removal of remaining principal shores.
8. Do not use wood or other formwork that is not structurally sound or that will not meet finish requirements.
9. Do not patch formwork.
10. Leave forms in place for minimum number of days according to ACI 347.

C. Form Removal:

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads, and removal has been approved by ENGINEER.
2. Loosen forms carefully; do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged.
4. Discard damaged forms.
5. Form Release Agent:
 - a. Apply according to manufacturer instructions.
 - b. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
 - c. Do not apply form release agent if concrete surfaces are indicated to receive special finishes or applied coverings that may be affected by agent.
 - d. Soak inside surfaces of untreated forms with clean water, and keep surfaces coated prior to placement of concrete.
6. Form Cleaning:
 - a. Clean forms as erection proceeds to remove foreign matter within forms.
 - b. Clean formed cavities of debris prior to placing concrete.
 - c. Flush with water or use compressed air to remove remaining foreign matter.
 - d. Ensure that water and debris drain to exterior through cleanout ports.
 - e. Cold Weather:
 - 1) During cold weather, remove ice and snow from within forms.
 - 2) Do not use de-icing salts.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

- 3) Do not use water to clean out forms unless formwork and concrete construction proceed within heated enclosure; use compressed air or other dry method to remove foreign matter.
7. Reuse and Coating of Forms:
 - a. Thoroughly clean forms and reapply form coating before each reuse.
 - b. For exposed Work, do not reuse forms with damaged faces or edges.
 - c. Apply form coating to forms according to manufacturer instructions.
 - d. Do not coat forms for concrete indicated to receive "scored finish."
 - e. Apply form coatings before placing reinforcing steel.
- D. Forms for Smooth Finish Concrete:
1. Use steel, plywood, or lined-board forms.
 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full-sized sheets of form liners and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Apply forming and strip wood forms in a manner to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- E. Form Anchors and Hangers:
1. Do not use anchors and hangers leaving exposed metal at concrete surface.
 2. Symmetrically arrange hangers supporting forms from structural-steel members to minimize twisting or rotation of member.
 3. Penetration of structural-steel members is not permitted.
- F. Inserts, Embedded Parts, and Openings:
1. Install formed openings for items to be embedded in or passing through concrete Work.
 2. Locate and set in place items required to be cast directly into concrete.
 3. Install accessories straight, level, and plumb, and ensure that items are not disturbed during concrete placement.
 4. Openings:
 - a. Provide temporary ports or openings in formwork as required to facilitate cleaning and inspection.
 - b. Locate openings at bottom of forms to allow flushing water to drain.
 5. Close temporary openings with tight-fitting panels, flush with inside face of forms, and neatly fitted such that joints will not be apparent in exposed concrete surfaces.
- G. Form Ties:
1. Provide sufficient strength and quantity to prevent spreading of forms.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

2. Place ties at least 1 inch away from finished surface of concrete.
 3. Leave inner rods in concrete when forms are stripped.
 4. Space form ties equidistant, symmetrical, and aligned vertically and horizontally unless indicated otherwise on Drawings.
- H. Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect on exposed surfaces to provide straight line at joints.
 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 3. Appearance:
 - a. Show no overlapping of construction joints.
 - b. Construct joints to present same appearance as butted plywood joints.
 4. Arrange joints in continuous line straight, true, and sharp.
- J. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features.
 2. Do not embed wood or uncoated aluminum in concrete.
 3. Obtain installation and setting information for embedded items furnished under other Sections.
 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 5. Ensure that conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 regarding size and location limitations.
- K. Openings for Items Passing through Concrete:
1. Frame openings in concrete where indicated on Drawings.
 2. Establish exact locations, sizes, and other conditions required for openings and attachment of Work specified under other Sections.
 3. Coordinate Work to avoid cutting and patching of concrete after placement.
 4. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- L. Screeds:
1. Set screeds and establish levels for tops of and finish on concrete slabs.
 2. Slope slabs to drain where required or as indicated on Drawings.
 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms; remove freestanding water.
- M. Screenshot Supports:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle-, pad-, or base-type screed supports that will not puncture membrane.
2. Staking through membrane is not permitted.

N. Cleanouts and Access Panels:

1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
2. Clean forms and surfaces against which concrete is to be placed.
3. Remove chips, sawdust, and other debris.
4. Thoroughly blow out forms with compressed air just before concrete is placed.

3.3 TOLERANCES

- A. Construct formwork to maintain tolerances according to ACI 301 and 318.
- B. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances according to ACI 117.

3.4 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.
- B. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- C. Inspection:
 1. Inspect erected formwork, shoring, and bracing to ensure that Work complies with formwork design and that supports, fastenings, wedges, ties, and items are secure.
 2. Notify ENGINEER after placement of reinforcing steel in forms but prior to placing concrete.
 3. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION 031000

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforcing bars.
2. Welded wire fabric.
3. Reinforcement accessories.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 318 - Building Code Requirements for Structural Concrete.
2. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
3. ACI SP-66 - ACI Detailing Manual.

B. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

C. ASTM International:

1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
3. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with placement of formwork, formed openings, and other Work.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1. Indicate bar sizes, spacings, locations, splice locations, and quantities of reinforcing steel and welded wire fabric.
 2. Indicate bending and cutting schedules.
 3. Indicate supporting and spacing devices.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Submit certified copies of mill test report of reinforcement materials analysis.

1.5 QUALITY ASSURANCE

- A. Perform Work according to ACI 318.
- B. Prepare Shop Drawings according to ACI SP-66.
- C. Perform Work according to state and local standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 1. Protect materials from moisture by storing in clean, dry location remote from construction operations areas.
 2. Provide additional protection according to manufacturer instructions.

1.7 EXISTING CONDITIONS

- A. Field Measurements:
 1. Verify field measurements prior to fabrication.
 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

1. Comply with ASTM A615.
2. Yield Strength: 60 ksi.
3. Billet Bars: Deformed unless otherwise indicated on the drawings.
4. Finish: Uncoated.

B. Welded Deformed Wire Fabric:

1. Comply with ASTM A1064.
2. Configuration: Flat sheets or Coiled rolls.
3. Finish: Uncoated.

C. Welded Plain Wire Fabric:

1. Comply with ASTM A1064.
2. Configuration: Flat sheets or Coiled rolls.
3. Finish: Uncoated.

2.2 FABRICATION

- A. Fabricate concrete reinforcement according to ACI 318.
- B. Form standard hooks for 180-degree bends, 90-degree bends, stirrups and tie hooks, and seismic hooks as indicated on Drawings.
- C. Form reinforcement bends with minimum diameters according to ACI 318.
- D. Fabricate column reinforcement with offset bends at reinforcement splices.
- E. Form ties and stirrups from following:
 1. Bars No. 10 and Smaller: No. 3 deformed bars.
 2. Bars No. 11 and Larger: No. 4 deformed bars.
- F. Weld reinforcement according to AWS D1.4.
- G. Splicing:
 1. If not indicated on Drawings, locate reinforcement splices at point of minimum stress.

2.3 ACCESSORY MATERIALS

- A. Tie Wire:
 1. Minimum 16 gage, annealed type.
- B. Chairs, Bolsters, Bar Supports, and Spacers:
 1. Size and Shape: To strengthen and support reinforcement during concrete placement conditions.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

2. Furnish load-bearing pad on bottom to prevent vapor retarder puncture.
- C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather-Exposed Concrete Surfaces:
 1. Material: Plastic-tipped steel.
 2. Size and Shape: To meet Project conditions.
- D. Reinforcing Splicing Devices:
 1. Type: Exothermic welding type; full tension and compression.
- E. Epoxy Coating Patching Material: Type as recommended by coating manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place, support, and secure reinforcement against displacement.
- B. Do not deviate from required position beyond specified tolerance.
- C. Do not weld crossing reinforcement bars for assembly except as permitted by ENGINEER.
- D. Do not displace or damage vapor retarder.
- E. Accommodate placement of formed openings.
- F. Spacing:
 1. Space reinforcement bars with minimum clear spacing according to ACI 318.
 2. If bars are indicated in multiple layers, place upper bars directly above lower bars.
- G. Maintain minimum concrete cover around reinforcement according to ACI 318 as follows:
 1. Footings and Concrete Formed against Earth: 3 inches
 2. Concrete Exposed to Earth or Weather:
 - a. No. 6 Bars and Larger: 2 inches
 - b. No. 5 Bars and Smaller: 1-1/2 inches
 3. Supported Slabs, Walls, and Joists:
 - a. No. 14 Bars and Larger: 1-1/2 inches
 - b. No. 11 Bars and Smaller: 3/4 inch
 4. Beams and Columns: 1-1/2 inches
 5. Shell and Folded Plate Members:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

- a. No. 6 Bars and Larger: 3/4 inch
- b. No. 5 Bars and Smaller: 1/2 inch

H. Splice reinforcing where indicated on Drawings according to manufacturer's instructions.

3.2 TOLERANCES

- A. Section 014000 - Quality Requirements: Requirements for tolerances.
- B. Install reinforcement within following tolerances for flexural members, walls, and compression members:
 - 1. Reinforcement Depth Greater Than 8 inches:
 - a. Depth Tolerance: Plus or Minus 3/8 inch
 - 2. Reinforcement Depth Less Than or Equal to 8 inches:
 - a. Depth Tolerance: Plus or Minus 1/2 inch
- C. Foundation Walls: Install reinforcement within tolerances according to ACI 530/530.1.

3.3 FIELD QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.
- B. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- C. Perform field inspection and testing according to ACI 318.
- D. Reinforcement Inspection:
 - 1. Placement Acceptance: Inspect specified and ACI 318 material requirements and specified placement tolerances.
 - 2. Welding: Inspect welds according to AWS D1.1.
 - 3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
 - 4. Weldability Inspection: Inspect for reinforcement weldability if formed from steel other than ASTM A706.
 - 5. Continuous Weld Inspection: Inspect reinforcement according to ACI 318.
 - 6. Periodic Weld Inspection: Inspect other welded connections.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Columns.
 - 5. Beams.
 - 6. Elevated slabs.
 - 7. Slabs on metal deck.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer, manufacturer, testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.
- H. Quality Control at Epoxy Terrazzo Substrates: Contractor shall establish and provide written quality control concrete slab finishing procedures reviewed by and acceptable to the (096623) epoxy terrazzo flooring manufacturer for (slab on grade) slab areas to receive epoxy terrazzo flooring to maintain the 1/8-inch in 10'-0" tolerance specified. Reduce high spots by approved mechanical means such as shot blast or special grinder. Fill low slab areas with cementitious or epoxy leveling compound acceptable to epoxy terrazzo flooring manufacturer and compatible with epoxy resin to attain level substrate for epoxy terrazzo work. Before concrete slab installation at epoxy terrazzo flooring areas, the General Contractor and installer shall review all screed elevations and spacing, extent of slab pour to help assure quality, and special conditions such as interface to stairs, elevator entrance thresholds and edge of slabs to minimize miscellaneous cracks.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

PENDER K-8 SCHOOL
PENDER COUNTY SCHOOLS
BURGAW, NORTH CAROLINA
Architect's Project No.: 631310

- 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.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. **Testing Agency Qualifications:** An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. **Concrete Testing Service:** Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. **Preinstallation Conference:** Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed 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.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. 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.
- E. 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.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire or plastic and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, Type II or Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

2.5 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.

2.6 FIBER REINFORCEMENT

- A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 3M; Scotchcast Polyolefin Fibers.
 - b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
 - c. FORTA Corporation; FORTA FERRO.
 - d. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
 - e. Nycon, Inc.; XL.
 - f. Propex Concrete Systems Corp.; Fibermesh 650.
 - g. Sika Corporation; Sika Fiber.

2.7 VAPOR BARRIERS

- A. Sheet Vapor Barrier: ASTM E 1745, Class A, with a permeance of less than 0.01 perms after mandatory conditioning (ASTM E1745, Section 7.1). Include manufacturer's recommended mastic, pressure-sensitive tape, and accessory materials.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15.
 - b. Reef Industries, Inc.; Griffolyn 15 mil Green.
 - c. Stego Industries, LLC; Stego Wrap 15 mil Class A
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.8 CONCRETE SEALING CURING MATERIALS

- A. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound (CONC-SLR): ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 1315.
 - b. ChemMasters; Polyseal WB,
 - c. Conspec by Dayton Superior; Sealcure 1315 WB.
 - d. Edoco by Dayton Superior; Cureseal 1315 WB.
 - e. Euclid Chemical Co., an RPM company; Super Diamond Clear VOX.
 - f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - g. Lambert Corporation; UV Safe Seal.
 - h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - i. Meadows, W. R., Inc.; Vocomp-30.
 - j. Metalcrete Industries; Metcure 30.
 - k. Right Pointe; Right Sheen WB30.
 - l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
 - m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Terrazzo Floor Areas: Do not use curing agents in areas to receive terrazzo flooring.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Reglets: Fabricate reglets of not less than 0.022-inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

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

PENDER K-8 SCHOOL
PENDER COUNTY SCHOOLS
BURGAW, NORTH CAROLINA
Architect's Project No.: 631310

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.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 25 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Slump Limit: 4 inches, or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Slump Limit: 4-5 inches.
 3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- C. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6% with a tolerance of plus 1 or minus 1.5 percent, for exterior concrete only, unless otherwise indicated.

2.14 FABRICATING REINFORCEMENT

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

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg , 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.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 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. Construct forms tight enough to prevent loss of concrete mortar.
- D. 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.
- E. 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.
- F. 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.

- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 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 reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 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.

3.4 VAPOR BARRIERS

- A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape. Seal to all penetrations and vertical surfaces.

3.5 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/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Terrazzo Coordination: Locate construction joints at terrazzo floor areas to align with joint and divider locations indicated on terrazzo floor pattern drawing, as approved.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete 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.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. 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 use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 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.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 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.
- 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.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and 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 restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish and to surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17 (F(L) not required at elevated slab).
 - b. At areas receiving a terrazzo floor finish, specified overall values of flatness, F(F) 35; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 24 (F(L) not required at elevated slab).
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and 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, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Minimum Compressive Strength: 3500 psi at 28 days.
 - 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 - 5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.11 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. **Removal:** After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. **Curing and Sealing Compound:** Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
5. **Terrazzo Floor Areas:** At areas to receive terrazzo flooring, cure concrete for a minimum of 28 days. Do not use curing agents in areas to receive terrazzo flooring.

3.12 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 six 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. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 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 to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar 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 (0.25 mm) 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.

3.14 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.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

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.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; 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.

PENDER K-8 SCHOOL
PENDER COUNTY SCHOOLS
BURGAW, NORTH CAROLINA
Architect's Project No.: 631310

- a. Cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one laboratory-cured specimen at 7 days and one set of three specimens at 28 days and hold one specimen for test at 56 days.
 - a. 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, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 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 temperature, batch to placement time, 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 do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

**SECTION 034500
PRECAST ARCHITECTURAL CONCRETE**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- F. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- H. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
- K. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.
- L. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- P. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
- Q. PCI MNL-120 - PCI Design Handbook.
- R. PCI MNL-122 - Architectural Precast Concrete: Fully Revised Manual Including New Sections, Extensive Updates, and Detailed Specifications to Meet Today's Construction Needs..
- S. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete.
- T. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.

- B. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
 - 1. Include special details and shapes such as building corners, window sills, keystones, and others as applicable.
 - 2. Include joint and reveal sizes, materials, and styles.
 - 3. Include details of mix designs.
 - 4. Include structural design calculations.
- C. Samples: Provide manufacturer's standard size samples illustrating surface finish, color, and texture.
- D. Test Reports: Submit test reports by an independent testing agency, for concrete materials, reinforcing, admixtures, and water-absorption testing.
 - 1. When approved by Architect, in lieu of test reports, fabricator may submit signed certificates in writing indicating material compliance with requirements.
- E. Designer's Qualification Statement.
- F. 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.

1.04 QUALITY ASSURANCE

- A. Design Engineer Qualifications: Design precast concrete units, including concrete mixes, reinforcement, anchorages, and supports, under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Comply with at least one of the following:
 - 1. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.
 - 2. Plant certified under Architectural Precast Association Plant Certification Program for production of architectural precast concrete.
- C. Installer Qualifications: Company specializing in performing installation work for architectural precast, including overhead applications; specifically trained or certified by fabricator for installation of architectural precast products.
- 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. Quality Standards: Comply with requirements of the following publications:
 - 1. PCI MNL-120 "PCI Design Handbook - Precast and Prestressed Concrete" for design and fabrication requirements.
 - 2. PCI MNL-117 "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products" for material, forming, testing, finish, and other quality control requirements.
 - 3. PCI MNL-135 "Tolerance Manual for Precast and Prestressed Concrete Construction" for manufacturing, fabrication, and installation tolerances.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Handling: Lift and support precast units only from support points.
- B. Protect units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Precast Concrete Fabricators:
 - 1. American Stone Virginia, LLC; Ladysmith, VA.
 - 2. Arban Precast, Ltd.; Dumfries, VA.
 - 3. Cast Stone Systems, Inc.; Warrenton, NC.
 - 4. Gate Precast Company; Oxford, NC.
 - 5. Metromont Corp.; Richmond, VA/Charlotte, NC/Greenville, SC.
 - 6. Seaboard Concrete Products Co.; Richmond VA.
 - 7. Southern Castings, Inc.; Valdosta, GA.
 - 8. Smith Midland; Midland, VA.
 - 9. Tindall Corp.; Petersburg VA/Spartanburg, SC.
 - 10. Substitutions: See Section 016000 - Product Requirements.

2.02 PRECAST UNITS, GENERAL

- A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
 - 1. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
 - 2. Calculate structural properties of units in accordance with ACI 318.
 - 3. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - 4. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.
- B. Sustainability: Coordinate with Division 01 Section "Sustainable Design Requirements." Provide reports and/or mix designs indicating amount of Portland cement replaced by fly ash, silica fume or other recycled waste material.
 - 1. Provide information indicating amount of recycled content in steel reinforcing, anchors, inserts, and other metal components.
- C. Finish Type: Provide a light sandblast or acid etch finish for a smooth surface texture.
 - 1. Color: Shall be selected from manufacturer's full range.

2.03 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi).

2.04 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Other Cementitious Materials:
 - 1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.
- C. Fine and Coarse Structural Aggregates: ASTM C33/C33M.
- D. Lightweight Structural Aggregate: ASTM C330/C330M.
- E. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 - 1. Color(s): As selected by Architect from manufacturer's full range.

- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Air Entrainment Admixture: ASTM C260/C260M.

2.05 MORTAR

- A. Mortar and Mortar Mix: Comply with Division 04 Section "Unit Masonry" for mortar materials and mixes.

2.06 SUPPORT DEVICES

- A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
 - 1. Clean surfaces of rust, scale, grease, and foreign matter.
 - 2. Galvanize after fabrication in accordance with requirements of ASTM A123/A123M.
- B. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563/A563M nuts and matching washers.
- C. Primer: Zinc rich type.

2.07 FABRICATION

- A. Fabricate in compliance with PCI MNL-117 and PCI MNL-135.
- B. Maintain plant records and quality control program during production of precast units. Make records available upon request.
- C. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
- D. Use form liners in accordance with manufacturer's instructions.
- E. Maintain consistent quality during manufacture.
- F. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
- G. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
- H. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- I. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.08 FABRICATION TOLERANCES

- A. Comply with PCI MNL-117 and PCI MNL-135, except as specifically amended below.
 - 1. Maximum Variation From Nominal Face Dimensions: Plus or minus 3/32 in.
 - 2. Maximum Variation From Square or Designated Skew: Plus or minus 1/8 inch in 10 feet.
 - 3. Maximum Variation from Thickness: Plus or minus 1/8 in.
 - 4. Maximum Misalignment of Anchors, Inserts, Openings: Plus or minus 1/8 inch.
 - 5. Maximum Bowing of Members: Plus or minus length/360.

2.09 SOURCE QUALITY CONTROL

- A. Provide testing and analysis of concrete mix. Testing and analysis may be performed by qualified plant personnel or by third party testing agency.
- B. Take concrete test cylinders as required to test for compressive strength, water-cement ratio, and other performance requirements indicated.
- C. Take air entrainment test cylinder for each set of exterior concrete test cylinders taken.

- D. Take water absorption test in accordance with PCI MNL-117.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace or repair damaged panels.
- B. Erect units level and plumb within allowable tolerances.
- C. Align and maintain uniform horizontal and vertical joints as erection progresses.
- D. Mechanical Fastening: Secure overhead units (such as lintels), copings, large precast panels, and other precast elements, as determined by fabricator's engineer, with mechanical connections or by welding of cast in anchors/studs to supporting structure, in accordance with fabricator's approved erection drawings.
- E. Precast Laid in Mortar: Provide full bed joint at sills, water tables, and similar precast elements. Rake bed joint back for pointing mortar, and point joint slightly concave. Coordinate with flashings, weeps, and other cavity wall materials.
- F. Joints Between Precast Pieces or Between Precast and Other Materials:
1. Provide sealant head joints where precast is exposed horizontally or protrudes from wall surface (for example, at all copings, sills, water tables, and similar shapes).
 2. Provide sealant joints at expansion and control joints, above shelf angles or other pressure-relieving joints, and at other building joints.
 3. Where precast is completely flush to adjacent wall surface (precast accent course without protruding from wall surface), all head and bed joints may be pointed with mortar.
 4. Prime precast before installation of sealant, as required by manufacturer for proper adhesion.
 5. Provide compressible filler/backer rod and sealant per Division 7 Section "Joint Sealants."
 6. Tool all precast joints (mortar and sealant) slightly concave.
- G. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.

3.04 TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Comply with PCI MNL-135.

3.05 REPAIR AND CLEANING

- A. Repair precast that is damaged during construction to create a uniform match to adjacent precast. If repair is unable to match to the satisfaction of the Owner, remove and replace the damaged piece of precast.
- B. Clean precast of soil, mortar, and other stains or markings.

3.06 PROTECTION

- A. Protect installed precast concrete from subsequent construction operations.

END OF SECTION 034500

**SECTION 042000
UNIT MASONRY**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ACI SP-66 - ACI Detailing Manual.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- G. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- I. ASTM C55 - Standard Specification for Concrete Building Brick.
- J. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
- K. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- L. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- M. ASTM C91/C91M - Standard Specification for Masonry Cement.
- N. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- O. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- P. ASTM C151 - Standard Test Method for Autoclave Expansion of Hydraulic Cement.
- Q. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
- R. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- S. ASTM C331/C331M - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
- T. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- U. ASTM C476 - Standard Specification for Grout for Masonry.
- V. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- W. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- X. ASTM C641 - Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates.
- Y. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

- Z. ASTM C887 - Standard Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar.
- AA. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry.
- BB. ASTM D1227/D1227M - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- CC. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- DD. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- EE. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- FF. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- GG. BIA Technical Notes No. 20 - Cleaning Brickwork.
- HH. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- II. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.
- JJ. NCMA TEK 08-04A - Cleaning Concrete Masonry.
- KK. NCMA TEK 12-01B - Anchors and Ties for Masonry.
- LL. NCMA TEK 12-02B - Joint Reinforcement for Concrete Masonry.
- MM. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting at the Project site one week before starting work of this section; require attendance by all relevant installers.

1.03 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- B. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories, for each type of masonry.
 - 1. Provide elevations indicating steel reinforcing bar locations; provide details of reinforcing including bends and cross-sections, in accordance with ACI SP-66.
 - 2. Indicate control and expansion joint locations.
 - 3. Provide flashing details indicating corners, end dams, and other special conditions.
- C. Samples: Face brick and mortar selections will be verified in mock-up panel. Provide samples of exposed accessories and trim requiring color selection.
- D. Material Certificates and Test Reports: Provide manufacturer's certificates and test reports for the following:
 - 1. Masonry Units:
 - a. Brick: Size data including fabrication tolerances.
 - b. Brick: Efflorescence test, per ASTM C67/C67M.
 - c. Masonry Units: Compressive strength test data.
 - d. Concrete Masonry: Data indicating aggregates comply with ASTM C33/C33M (normal weight), ASTM C331/C331M (lightweight), and ASTM C618 (fly ash).
 - 2. Mortar and Grout Mixes: Provide description and proportion of materials for each type of mortar and grout.

3. Provide material certificates for each type of metal accessory, including reinforcing bars, joint reinforcement, veneer ties and anchors, and other indicated accessories, indicating compliance with requirements.

E. Installer's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530.1/ASCE 6/TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Fire Rated Assemblies: Provide products that comply with fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent testing thickness, or by means acceptable to authorities having jurisdiction.
- C. Masonry Subcontractor Qualifications: The work of this section shall be bid and performed by a firm certified as a "North Carolina Masonry Contractors Association Certified Masonry Contractor" as described in the most current version of the NCMCA's "Guide to Masonry Contractor Certification." (North Carolina Masonry Contractors Association, PO Box 3463, Hickory, NC 28603-3463, 828-324-1564, information@ncmca.com).
 1. The masonry subcontractor shall at all times when work is in progress, provide an individual from its own staff designated by the North Carolina Masonry Contractors Association Masonry Contractor Certification Program as a "CMP-Certified Masonry Professional" or "CME-Certified Masonry Executive" (as described in the most current version of the NCMCA's "Guide to Masonry Contractor Certification") on-site to supervise work in progress.
- D. Source Limitations for Masonry: Provide each type of masonry unit from a single manufacturer's plant, sourced through a single supplier. Each type of masonry unit shall maintain consistency of color and texture for all product required on the entire project. The approved mockup/sample panel shall be used to determine acceptable color and texture range.
 1. Source Limitations for Decorative Concrete Masonry: Provide decorative concrete veneers from a manufacturer with a quality control agreement with water repellent manufacturer, certifying that units have been manufactured with integral water repellent to conform to performance requirements indicated. Provide current certificate from water repellent manufacturer confirming conformance.
- E. Source Limitations for Mortar: Provide each mortar mix from a single manufacturer, sourced through a single supplier. Each required mortar mix shall maintain consistency of each component, including cementitious materials and aggregate, to provide consistent color and texture for all product required on the entire project. The approved mockup/sample panel shall be used to determine acceptable color and texture range.
- F. Aggregate for Concrete Masonry Units: If bottom ash is used as aggregate in the CMU, the Source for the bottom ash shall be a power station that has a minimum of ten (10) years continuous experience as a supplier of quality material as verified by independent certified laboratory testing and no defects in the marketplace.
- G. Pre-Construction Testing: Owner shall engage an independent testing agency to perform field quality control tests, in accordance with Section 014000 - Quality Requirements.
 1. Clay Masonry Unit Tests: Testing agency shall test each variety of clay masonry in accordance with ASTM C67/C67M compressive strength requirements.
 2. Concrete Masonry Unit Tests: Testing agency shall test each variety of concrete unit masonry in accordance with ASTM C140/C140M compressive strength requirements.

1.05 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
-

- B. Sample Panel: Build a sample panel approximately 48 inches long by 32 inches high. Include each type of masonry veneer and mortar. Include a sealant filled control joint.

1.06 FIELD CONDITIONS

- A. Wall Cavity Protection: Provide temporary waterproof sheet coverings over masonry walls at top of walls, sills, parapets, and other horizontal projections. Install coverings at end of each workday, when rain or precipitation is expected, and after masonry work is completed.
 - 1. Extend coverings down vertically at least 24 inches on each side of masonry wall. At multi-wythe walls where one wythe is more than 24 inches taller than other wythe(s), extend covering as required to fully cover all wythes and cavities.
 - a. At roof parapets, extend covering on rear side of parapet full height down to roof deck/membrane, until vertical protection/roof membrane is installed.
 - 2. Secure all coverings in place with tape or adhesive that does not leave residue, or other securement method that does not penetrate or damage permanent construction.
 - 3. Provide protective coverings at sills and horizontal projections that can also serve as protection from mortar droppings.
 - 4. Provide protective coverings over tops of foundation walls containing insulation to protect from exposure to sun and from construction traffic damage.
 - 5. Do not remove or allow removal of temporary covers until permanent top of wall protection elements (coping, sill, roof surface, waterproof membrane, etc) are underway.
- B. Cold- and Hot-Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, other detailed conditions, and as indicated below.
 - a. Provide bullnose units for outside corners.
 - b. Provide solid block with bullnosed top edges at free-standing CMU walls and where top of block is exposed at window sills and similar applications.
 - 3. Concrete Masonry Units: ASTM C90, lightweight.
 - a. Exposed Faces: Manufacturer's standard color and texture.
 - b. Aggregates:
 - 1) Lightweight Aggregates: Lightweight aggregate shall strictly comply with ASTM C331/C331M, ASTM C151, and ASTM C641. Drying shrinkage of aggregate shall not exceed 0.10% at 100 days.
 - 2) Waste concrete, scoria, and aglite shall not be permitted.
- B. Concrete Brick:
 - 1. Actual Size: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2. Concrete Building Brick: ASTM C55; lightweight, solid, for interior or concealed use.

2.02 BRICK UNITS

- A. Unit Cost Allowance: Face brick shall be furnished via unit cost allowance. Unit cost shall cover purchase of brick and transport to the project site.
 1. Face Brick Unit Cost: \$1,500 per thousand.
 2. Bidders and material suppliers are responsible for determining cost to produce special shape units, such as "lipped" brick units. The unit cost shall not cover installation, overhead or profit.
 3. The Contract Sum will be adjusted to reflect the actual cost of selected brick in accordance with the General Conditions. The Contractor shall submit receipts and initiate Change Order process.
 4. The Contractor is reminded that unit cost includes all required taxes, less applicable trade discounts, in accordance with the General Conditions.
- B. Facing Brick: ASTM C216, Type FBS or FBX, Grade SW.
 1. Color and Texture: Provide one of the following:
 - a. Face Brick 1: Color and texture to match Architect's sample.
 - b. Face Brick 2: Color and texture to match Architect's sample.
 2. Actual Size: 3-5/8 inches wide by 3-5/8 inches high by 11-5/8 inches long (utility).
 3. Special Shapes: Molded units (plant-fabricated) as required by conditions indicated, unless standard units can be sawn to produce equivalent effect. Cut or sawn edges shall not be exposed in the finished work.
 4. Efflorescence: Provide brick that has been tested per ASTM C67/C67M and received a rating of "not effloresced."
- C. Building (Common) Brick: ASTM C62, Grade SW, except MW may be used in locations indicated acceptable in reference standard; solid units.
 1. Actual size: Match face brick.
 2. Locations: May be used in concealed locations in lieu of face brick.

2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M.
 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
 2. Available Products:
 - a. Argos USA; Magnolia Masonry Cement.
 - b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
 - c. Lehigh Hanson; flamingo Colored Cement.
 - d. Roanoke Cement; a division of Titan America; Colored Masonry Cement.
 - e. York Building Products, a Stewart Company; Workrite Colored Masonry Cement.
 - B. Surface Bonding Mortar (Parge Coat): ASTM C887.
 - C. Mortar Aggregate: ASTM C144.
 - D. Grout Aggregate: ASTM C404.
 - E. Water: Clean and potable.
 - F. Accelerating Admixture: ASTM C494/C494M, Type C; nonchloride, noncorrosive type for use in cold weather; approved by manufacturer for use in masonry mortar.
-

2.04 DAMPPROOFING

- A. General: Dampproofing may be provided as a Contractor option to parge coat, applied to exterior face of below grade CMU back up wall (prior to insulation or grouting).
- B. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
 - 1. Emulsified Asphalt Coating (Brush or Spray Applied): ASTM D1227/D1227M, Type II, Class 1 - Mineral colloid emulsifying agents with non-asbestos fibers or Type III, Class 1 - Mineral colloid emulsifying agents without fibrous reinforcement.
 - 2. Accessory Materials: Provide asphaltic primer, glass fiber reinforcement, and compatible patching compounds as required and as recommended by manufacturer.
 - 3. Manufacturers:
 - a. Henry Company.
 - b. Karnak Corporation.
 - c. Mar-Flex Systems, Inc.
 - d. W. R. Meadows, Inc.
 - e. Substitutions: See Section 016000 - Product Requirements.

2.05 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.
- B. Joint Reinforcement, Anchorage, and Ties, General: Comply with NCMA TEK 12-02B, NCMA TEK 12-01B, and requirements below.
 - 1. Use ladder type joint reinforcement, unless otherwise indicated. Truss type reinforcement may be used only when approved by Architect, at walls indicated not to have vertical reinforcing steel and not to be grouted.
 - 2. Provide prefabricated joint reinforcement sections for corners and for T-intersections.
 - 3. Provide joint reinforcement in minimum 10 foot lengths.
 - 4. At multi-wythe/cavity wall applications, size all anchors, ties, and reinforcement for depths of cavities indicated, including indicated insulation thickness as applicable. Ties shall maintain full adjustability at veneer wythe without affecting insulation.
 - 5. At cavities with air space wider than 4-1/2 inches, provide high strength ties engineered for cavity depths indicated.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Material: Mill-galvanized steel for interior walls, hot-dip galvanized steel for exterior walls.
 - 2. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- D. Multiple Wythe Joint Reinforcement: ASTM A951/A951M. Provide at composite walls and subgrade walls where all wythes are of the same material.
 - 1. Material: Mill-galvanized steel for interior walls, hot-dip galvanized steel for exterior walls.
 - 2. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
 - a. Provide two side rods for each wythe that is nominal 6-inch depth or greater, and one side rod for each wythe that is nominal 4-inch depth.
- E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M. Provide at cavity walls/masonry veneer walls.
 - 1. Type: Ladder, with adjustable ties or tabs spaced at 16 in on center.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

2. Material: Hot-dip galvanized steel.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to extend at least halfway through veneer wythe, but provide not less than 5/8 inch of mortar coverage from each masonry face.
 4. Vertical adjustment: Not more than 1 1/4 inches.
- F. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- G. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
1. For Anchorage to Structural Steel Framing: Crimped wire anchors for welding to frame, 0.25 inch thick, with triangular/trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B. Provide at masonry veneer walls with metal framing backup. At cavity walls with CMU backup and masonry veneer, masonry veneer anchors may be used in conjunction with standard horizontal joint reinforcing, at Contractor's option, in lieu of adjustable multiple wythe joint reinforcement.
1. Anchor Plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 2. Wire Ties: Manufacturer's standard shape, 0.1875 inch thick.
 - a. Size wire ties to extend at least halfway through veneer wythe, but provide not less than 5/8 inch of mortar coverage from masonry face.
 3. Vertical Adjustment: Not less than 3-1/2 inches.
- I. Metal-to-Metal Fasteners (for Steel Studs): Self-drilling, self-tapping #10 hex screws; fabricated of either 304 stainless steel or of steel with corrosion resistant polymer coating tested to ASTM B117. Fasteners shall include integral neoprene or EPDM washer.
1. Manufacturers:
 - a. ELCO Construction Products; Dril-Flex with Stalgard Finish.
 - b. Heckmann Building Products; #668 TEK Self-Drilling Steel Stud Screw.
 - c. ITW Commercial Construction North America; Teks Maxiseal with Climaseal Finish, or Scots Long Life Teks (stainless steel).

2.06 FLASHINGS

- A. Combination Nonasphaltic Flashing Materials - Copper:
1. Copper/Polymer Film or Fabric Flashing: 5 oz/sq ft copper sheet laminated between two sheets of polymer film. Minimum Puncture Resistance of 780 psi, when measured in accordance with ASTM E154/E154M.
 - a. Available Products:
 - 1) Advanced Building Products, Inc.; Copper Sealtite 2000.
 - 2) Hohmann & Barnard, Inc; Copper-Fabric NA.
 - 3) STS Coatings, Inc.; Wall Guardian Copper TWF.
 - 4) York Manufacturing, Inc; Multi-Flash 500 Series.
- B. Factory-Fabricated Flashing Corners and End Dams: Copper.
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PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- C. Termination Bars: One-inch wide, fabricated of 0.125-inch PVC, 0.090-inch extruded aluminum, or 0.075-inch stainless steel; compatible with membrane and adhesives.
- D. Drip Edge: Copper; angled drip with hemmed edge; compatible with membrane and adhesives.
- E. Flashing Sealant/Adhesive/Liquid Seam Tape: Polyether-based, 100% solids, moisture-curing elastomeric products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates; and that are compatible with asphalt-free flashing materials and air barrier materials. Traditional mastic is not acceptable.
 - 1. Available Products:
 - a. Master Builders Solutions; MasterSeal NP150.
 - b. STS Coatings; GreatSeal LT-100 Liquid Tape.
 - c. York; UniverSeal US-100 Liquid Tape.

2.07 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Provide nominal 2.5-inch "standard" and "tee" configurations to suit application unless indicated otherwise.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations. Provide in depth matching cavity depth without gap at front or back of mesh. Fabricate approximately 10 inches high with minimum 6 inch high dovetail shape projections.
 - a. Available Products:
 - 1) Advanced Building Products, Inc; Mortar Break DT.
 - 2) Heckmann Building Products; WallDefender.
 - 3) Hohmann & Barnard, Inc.; Mortar Trap.
 - 4) Mortar Net Solutions; MortarNet.
 - 5) Wire-Bond; Cavity Net DT (3611D).
 - b. At cavities with depth greater than 2 inches, provide companion drainage product by one of the manufacturers above; nominal 1/2-inch thickness by 20 inches wide, to be field inserted into cavity in a "U" configuration. Basis-of-Design is "Mortar Catch 352" by Advanced Building Products, Inc.
- D. Bond Break: ASTM D226/D226M, Type I ("No.15") asphalt felt or polyethylene tape.
- E. Weeps/Cavity Vents:
 - 1. Cellular Type: Extruded propylene with honeycomb design.
 - a. Color(s): To be selected by Architect from manufacturer's full range.
 - b. Available Products:
 - 1) Advanced Building Products, Inc.; Mortar Break weep mesh.
 - 2) Blok-Lok Limited; Cell-Vent.
 - 3) CavClear/Archovations, Inc.; CavClear Weep Vent.
 - 4) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 5) Hohmann & Barnard, Inc.; Quadro-Vent.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- 6) Mortar Net Solutions; WeepVent.
 - 7) Wire-Bond; Cell Vent.
2. Bed Joint Weep System: Corrugated plastic drainage system incorporating continuous drainage strip within cavity portion of wall with integral weephole extensions at 9-1/2 inches on center located above flashing in the bed joint of the veneer masonry. Provide at masonry units over 32 inches long, and as indicated.
 - a. Available Products:
 - 1) Heckmann Building Products; Core/Cavity Vent Weep System #367.
 - 2) Masonry Technology Incorporated (MTI); Cavity Weep CV 5010.
- F. Reinforcing Positioners: Provide wire positioners in bed joints to keep steel reinforcing bars centered in cells, fabricated of 0.1483-inch hot-dip galvanized steel wire.
 1. Available Products:
 - a. Heckmann Building Products, Inc.; No. 376 Rebar Positioner.
 - b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
 - G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

- A. Masonry Lintels: Fabricated of bond beam CMUs, with texture matching adjacent standard CMU. Provide reinforcing bars and grout in accordance with structural requirements. Provide temporary supports until cured.
- B. Precast Concrete Lintels: Comply with structural requirements for concrete strength and reinforcing. Precast U-lintels fabricated in accordance with performance standards of PCI MNL-116 with 3500 psi concrete for standard lintels and 6000 psi concrete for prestressed lintels as manufactured by Cast-Crete are acceptable in lieu of rectangular section lintels.
- C. Steel Lintels: Refer to Section 055000 - Metal Fabrications.

2.09 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 1. Masonry below grade and in contact with earth: Type S.
 2. Reinforced masonry: Type S.
 3. Mortar parge coats: Type S.
 4. Exterior, loadbearing and non-loadbearing, and interior, loadbearing and non-loadbearing: Type N, except as indicated above.
 - a. Interior, non-loadbearing masonry may use Type O at Contractor's option.
 - B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
 1. Use colored mortar for all veneer masonry. Separate colors shall be required for each type and color of veneer.
 - C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
 - E. Mixing: Use mechanical batch mixer and comply with referenced standards.
-

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. For installation in cold or hot weather, comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
 - 1. CMU Coursing: One unit and one mortar joint equal 8 inches.
 - 2. Brick Coursing: Either two or three units with accompanying mortar joints shall equal 8 inches, based on basis-of-design brick size(s) indicated above.
- C. Provide running bond for all masonry units unless otherwise indicated.
- D. Tool all mortar joints slightly concave where they will be exposed, unless otherwise indicated.
 - 1. Provide flush joints where they will be concealed by surface-applied treatments or finishes other than paint; including but not limited to tile, wall coverings, fluid-applied or SPF air barriers, or membranes.

3.05 PLACING AND BONDING

- A. Remove broken, cracked, chipped, or otherwise damaged masonry units from pallets and set aside. Do not use unless they may be field cut to remove damaged section, for installation where special shape is required to fit construction.
- B. Create a consistent blend for each type of veneer masonry by mixing units from a minimum of three pallets.
- C. Provide asphalt felt or polyethylene tape bond-breaker between clay masonry and concrete or other masonry types. Rake back joints for sealant.
- D. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- E. Lay hollow masonry units with face shell bedding on head and bed joints.
- F. Remove excess mortar and mortar smears as work progresses.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

1. Do not cut masonry unless it is required for certain shapes, such as rowlock sills, or unless it is unavoidable due to fitting around other construction, such as wall penetrations.
2. Cut masonry edges shall not be visible in the final work. Where special shapes are required that would expose cut edges, they shall be plant-fabricated.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. At parapets and below-grade/foundations, provide joint reinforcement at 8 inches o.c. vertically.
- E. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- F. Lap joint reinforcement ends minimum 6 inches.
- G. Do not extend reinforcement across control, expansion, and other building movement joints.
- H. Reinforce corners and intersections with prefabricated T- or L-shaped reinforcing.
- I. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.
- J. Embed ties and anchors in mortar joint and extend at least halfway through masonry veneer unit; with at least 5/8 inch mortar cover to the outside face of the anchor.

3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry and/or Metal Framing Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 REINFORCEMENT AND ANCHORAGES - COMPOSITE UNIT MASONRY

- A. Install continuous horizontal joint reinforcement at 16 inches o.c. vertically, except at below grade foundation walls install at 8 inches o.c. vertically.
 - B. Where concrete foundations are indicated, tie below-grade masonry to concrete with rigid anchors spaced at maximum 8 inches o.c. vertically.
 - C. Coordinate with parging/dampproofing and with installation of insulation, where indicated.
-

3.11 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 2. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 16 inches minimum on vertical surface of backing:
 - 1. Anchor vertical leg of flashing into backing with a termination bar and sealant.
- C. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
 - 1. Notch and hem exterior corners of drip edges to eliminate sharp, exposed cut metal edges at locations below 6' - 0" above grade.
- D. Support flexible flashings across gaps and openings.
- E. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.12 LINTELS

- A. Comply with requirements on Structural Drawings for type of lintel at each opening, additional lintel sizing, reinforcement, and installation requirements.
- B. Install loose steel or precast lintels over openings, where indicated.
- C. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Allow masonry lintels to attain specified strength before removing temporary supports.
- D. Maintain minimum 8 inch bearing on each side of opening, unless otherwise indicated.

3.13 GROUTED COMPONENTS

- A. Comply with requirements on Structural Drawings for locations of structural grouted components and accessories, including but not limited to, grouted bond beams, reinforced unit masonry walls, (including locations and sizing of vertical steel bar reinforcing), grouted solid CMU, and composite wall collar joints.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.

3.14 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Provide control and expansion joints at locations indicated on Drawings, and as follows:
 - 1. At changes in wall height.
 - 2. At changes in wall thickness
 - 3. At change in support (eg: transition from foundation support to floor slab support).
 - 4. Adjacent to corners of walls within a distance equal to no more than half the maximum control joint spacing.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

5. Wall intersections.
6. Do not place control joints closer than 16 inches to edge of wall openings (doors, windows, louvers, ducts).
7. Distance between joints shall not exceed a length to height ratio of 1.5:1.
8. Distance between joints shall not exceed 25 feet where no openings occur between joints.
9. Distance between joints shall not exceed 20 feet where openings occur between joints.

3.15 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 1. Mix mortar (or grout) to a 4-inch maximum slump consistency and hand trowel into place in accordance with Steel Door Institute (SDI-100).
 2. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 PARGING

- A. Dampen masonry walls prior to parging.
- B. Parge cavity side of CMU below grade back-up wythe with a single coat of surface-bonding mortar to a total thickness of 1/4 inch.
 1. In lieu of parging, Contractor may at its option apply bituminous dampproofing, at a minimum rate of 1.25 gal per 100 sq. ft. Apply primer if required by manufacturer and comply with manufacturer's installation requirements.
- C. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.
- D. Strike top edge of parging at 45 degrees.

3.19 FIELD QUALITY CONTROL

- A. Field Inspection: The Owner shall engage an independent inspection agency to perform field quality control inspections and prepare field reports.
 - 1. The Contractor shall permit full access to inspectors in order to perform inspections, including use of temporary facilities and equipment such as scaffolding or lifts.
 - 2. Do not enclose cavities or spaces to be grouted solid until inspections have approved grout and reinforcement for material properties, size, and installation locations.
- B. Field Testing: The Owner shall engage an independent testing agency to perform field quality control tests, as specified in Section 014000 - Quality Requirements. For each type of masonry unit, 5 randomly chosen units shall be sampled for each 5,000 square feet of wall.
 - 1. Clay Masonry Unit Tests: Testing agency shall test each variety of clay masonry in accordance with ASTM C67/C67M requirements.
 - 2. Concrete Masonry Unit Tests: Testing agency shall test each variety of concrete unit masonry, of each load-bearing size indicated, in accordance with ASTM C140/C140M requirements.
 - 3. Mortar Tests: Testing agency shall test each type of mortar in accordance with ASTM C780. Mortar shall be tested on each of the first 3 days. Alert testing agency if mortar mix is altered during construction to allow for retesting.
 - 4. Grout Test: Testing agency shall test each type of grout in accordance with ASTM C1019. Grout shall be tested on each of the first 3 days. Alert testing agency if grout mix is altered during construction to allow for retesting.

3.20 REPAIR AND CLEANING

- A. Remove masonry units that have become damaged or stained, or that do not display acceptable blend of color and texture matching mockup/sample panel. Remove as whole units, do not cut. Replace with new units with fresh mortar joints.
- B. Remove excess mortar and mortar droppings.
- C. Replace defective mortar and repoint. Enlarge holes or voids at defective mortar, and remove enough adjacent mortar to allow for repointing. Install fresh mortar joint and match to adjacent work.
- D. Where expansion/control joints and sealant joints are indicated, clean joints and leave them clear and ready for installation of joint or sealant materials.
- E. Clean concrete masonry in accordance with NCMA TEK 08-04A and clean clay masonry in accordance with BIA Technical Notes No. 20. Use hand cleaning/bucket-and-brush methods.
- F. To prevent freezing of cleaners and rinse water, do not clean when masonry surface temperature will drop below 40 degrees F.
- G. Test cleaning methods and materials on one half of mockup/sample panel; leave the other half uncleaned. Obtain approval of Architect before cleaning the finished work.
- H. Protect adjacent non-masonry surfaces from cleaning materials and processes with temporary sheeting or masking.
- I. Provide "in-progress" cleaning; clean masonry in each area as soon as possible after mortar has fully cured (approximately 7 to 28 days; coordinate with manufacturer's recommendations for each mortar type specified). Field test a small area to ensure mortar curing is complete prior to large-scale cleaning.
- J. Pre-wet masonry surfaces and clean with specified cleaning solution. Rinse surfaces immediately after cleaning; do not allow cleaning solution to dry or set into the masonry.

- K. Use non-metallic tools in cleaning operations.
- L. Final Cleaning: As part of Project Closeout (prior to Substantial Completion), provide Final Cleaning of masonry veneer. Remove construction dust with a very low pressure rinse. Perform a visual inspection and spot clean to remove efflorescence, staining, or organic growth, in accordance with recommendations of BIA and NCMA technical notes.

3.21 PROTECTION

- A. Provide temporary protective waterproof sheet coverings over tops of walls, parapets, sills, and other horizontal projections as the work progresses, in accordance with FIELD CONDITIONS article in Part 1 above.
- B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- C. Provide protective vertical boards and horizontal sheeting at grade level base of walls to prevent staining or splashing from rain, mud, or mortar droppings.

3.22 MASONRY WASTE

- A. Fill Material: Clean masonry waste may be used as fill material. Break up masonry waste into small pieces no greater than 4 inches any direction. Mix with Division 31 engineered fill material so that masonry waste is no more than 33% of the fill (1 part masonry waste, 2 parts engineered fill). Fill containing masonry waste shall be at least 18 inches below grade level.
 - 1. Excess waste shall be removed and disposed of or recycled in accordance with Division 1 waste disposal requirements.

END OF SECTION 042000

**SECTION 047200
CAST STONE MASONRY**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- G. ASTM C150/C150M - Standard Specification for Portland Cement.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
- I. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.
- J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone.

1.02 SUBMITTALS

- A. Product Data: Test results of cast stone components made previously by the manufacturer.
- B. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- C. Selection Samples: In the form of manufacturer's color charts, indicating full range of cast stone colors and textures, and mortar colors.
- D. Verification Samples: Cast stone units and mortar will be verified in mock-up panel.
- E. Source Quality Control Test Reports.
- F. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
 - 2. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
 - 3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.04 MOCK-UP

- A. See Section 014000 - Quality Requirements for additional requirements.

- B. Integrated Exterior Mockups: Attend preinstallation conference and provide cast stone masonry work for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Cast Stone:
 - 1. Arban Precast, Ltd.
 - 2. Arriscraft; division of General Shale.
 - 3. Cast Stone Systems, Inc.
 - 4. Continental Cast Stone.
 - 5. Premier Stoneworks, LLC.
 - 6. Reading Rock, Inc.; RockCast.
 - 7. Southern Castings, Inc.
 - 8. Stafford Stone Works.

2.02 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
 - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
 - 4. Color: To be selected by Architect from manufacturer's full range.
 - 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.

2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.03 MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 1. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979/C979M, inorganic iron oxides; do not use carbon black.
- E. Admixtures: ASTM C494/C494M.
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.04 SOURCE QUALITY CONTROL

- A. Test compressive strength and absorption of specimens selected at random from plant production.
 1. Test in accordance with ASTM C642.
 2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 042000.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:

1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

- A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 1. Rake mortar joints 3/4 inch for pointing.
 2. Remove excess mortar from face of stone before pointing joints.
 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints in projecting units.
 - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - d. Joints below lugged sills and stair treads.
 - e. Joints below ledge and relieving angles.
 - f. Joints labeled "expansion joint".
- B. Installation Tolerances:
 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
 4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

- A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
 1. Wet surfaces with water before applying cleaner.
 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 3. Remove cleaner promptly by rinsing thoroughly with clear water.
 4. Do not use acidic cleaners.
- B. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

- A. Protect completed work from damage.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION 047200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Requirements:
 - 1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
 - 2. Section 055000 "Metal Fabrications" miscellaneous steel fabrications and other steel items not defined as structural steel.

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."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

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

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Identify members and connections of the Seismic-Load-Resisting System.
 - 6. Indicate locations and dimensions of protected zones.
 - 7. Identify demand critical welds.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

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

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of braced frame and shear walls.
- D. Recycled Content: Provide products with a minimum post-consumer recycled content of 75%.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, Grade 50.
- B. Channels, Angles-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 572/A 572M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
 - 1. Weight Class: as indicated.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Unheaded Anchor Rods: ASTM F 1554, Grade 36
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.

- 5. Finish: Plain.
 - G. Headed Anchor Rods: ASTM F 1554, Grade 55, include supplement S1, straight.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 4. Finish: Plain.
 - H. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 3. Finish: Plain.
 - I. Clevises: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
 - J. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
 - K. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
- 2.4 PRIMER
- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - B. Primer: Comply with Division 9.
 - C. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
 - D. Galvanizing Repair Paint: ASTM A 780/A 780M.
- 2.5 GROUT
- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- 2.6 FABRICATION
- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool 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/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

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

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.

- 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. For Concealed Steel:
 - a. SSPC-SP 2, "Hand Tool Cleaning."
 - b. SSPC-SP 3, "Power Tool Cleaning."
 - 2. For Exposed Steel:
 - a. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

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 and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- 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 plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate where indicated.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.

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

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: Snug tightened, unless noted otherwise.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.6 REPAIRS AND PROTECTION

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

END OF SECTION 051200

SECTION 051213
ARCHITECTURALLY-EXPOSED STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 DEFINITIONS

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

1.02 REFERENCE STANDARDS

- A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- G. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts 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.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- L. SSPC-SP 1 - Solvent Cleaning.
- M. SSPC-SP 6 - Commercial Blast Cleaning.

1.03 ADMINISTRATIVE REQUIREMENTS

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

1.04 SUBMITTALS

- A. Product data for each type of product specified. Submit paint systems in accordance with Section 099113.
- B. Shop Drawings: Detailing for fabrication of AESS components.
 - 1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.

2. Include details that clearly identify AESS requirements found in this specification. Provide connections for AESS consistent with concepts shown on drawings.
 3. Indicate welds by AWS A2.4 symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined by the designated AESS category.
 4. Indicate orientation of hollow structural section (HSS) seams and mill marks (where applicable).
 5. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate orientation of bolt heads.
 6. Indicate which surfaces or edges are exposed and what class of surface preparation is being used.
 7. Indicate special tolerances and erection requirements as noted on drawings or defined by the designated AESS category.
 8. Indicate vent or drainage holes for HSS members.
- C. AESS 1, AESS 2, AESS 3, AESS 4, and AESS C Samples: Provide samples of specific AESS characteristics. Samples may be small size samples or components of conventional structural steel demonstrating specific AESS characteristics, including surface preparation, sharp edges ground smooth, continuous weld appearance, weld show through, and fabrication mark removal.
- D. 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.
- E. Qualification data for fabricator and erector to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, photographs showing detail of installed AESS, and other information specified.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: In addition to those qualifications listed in Section 051200, engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the work.
- B. Erector Qualifications: In addition to those qualifications listed in Section 051200, engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.
- C. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work..
- D. Comply with applicable provisions of AISC 303, Section 10 for the designated AESS category.
- E. Contractor to engage a quality assurance agency per requirements of AISC 360, Chapter N and AISC 303, Section 10.

1.06 MOCK-UP

- A. Provide mock-ups for AESS 3, AESS 4, and AESS C of nature and extent indicated in Contract Documents.
- B. See Section 014000 - Quality Requirements for additional requirements.

- C. Locate mock-ups in fabricator's shop. Mock-ups to be full-size unless Architect approves smaller models. Alternatively, when a mock-up is not practical, the first piece of an element or connection can be used to determine acceptability.
- D. Notify Architect one week in advance of dates and times when mock-ups will be available for review.
- E. Demonstrate applicable AESS characteristics for specified category of AESS on elements and joints in mock-up.
- F. Build mock-ups using member sizes and materials indicated for final work.
- G. Mock-up to demonstrate weld quality, contouring of welds at aligned walls of members, specified surface preparation, and finish coating.
- H. HSS members to extend at least 6 inches from joint in mock-up.
- I. Obtain Architect's written approval of mock-ups before starting fabrication.
- J. Retain and maintain mock-ups during construction in an undisturbed condition as a standard for judging completed work.
- K. Approved mock-ups in an undisturbed condition at Date of Substantial Completion may become part of completed work.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Comply with Section 051200, except as amended in this section for aesthetic purposes.
- B. Comply with AISC 303, Section 10 for specific AESS category designated on drawings.

2.02 FABRICATION

- A. Fabricate and assemble AESS in shop to greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Architect. Detail AESS assemblies to minimize field handling and expedite erection.
- B. Permissible tolerances for member depth, width, out of square, and camber and sweep to be as specified in ASTM A6/A6M, ASTM A500/A500M, and ASTM A1085/A1085M.
- C. For curved structural members, whether composed of a single standard structural shape or built-up, the as-fabricated variation from theoretical curvature to be equal to or less than standard camber and sweep tolerances permitted for straight members in applicable ASTM standard.
- D. Use special care in handling and shipping of AESS both before and after shop painting to minimize damage to any shop finish. Use nylon-type slings or softeners when using chains or wire rope slings.
- E. Bolted Connections:

1. Make in accordance with Section 051200. Provide bolt type and finish as noted herein.
- F. Welded Connections:
1. Comply with AWS D1.1/D1.1M and Section 051200.
 2. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding tolerances of this section.
- G. Surface Preparation:
1. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 2. Remove backing and run out tabs.
- H. Fabricate AESS in accordance with categories defined in AISC 303, as follows:
1. AESS 1: Basic elements.
 2. AESS 2: Feature elements viewed at a distance greater than 20 feet (feature elements not in close view).
 3. AESS 3: Feature elements viewed at a distance less than 20 feet (feature elements in close view).
 4. AESS 4: Showcase elements with special surface and edge treatment beyond fabrication (showcase elements).
 5. _____
 6. Add modifications to characteristics included in AISC 303 matrix in order to modify one or more of the defined AESS categories and create a custom AESS C.
 7. _____
 8. AESS C: Custom elements; fabricate to requirements of AESS 1 and the following characteristics:
 - a. C.1: _____.
 - b. C.2: _____.
 - c. C.3: _____.

2.03 PAINT SYSTEM

- A. Compatibility: All components/procedures of AESS paint system to comply with coating system specified, submitted, and approved per Section 099100 - Painting. As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating, and finish coating to be from a single manufacturer combined in a system documented by manufacturer with adequate guidance for fabricator to procure and execute.
- B. Primer: Organic, epoxy/zinc rich meeting class B surface requirements for slip critical connections, as found in AISC 360. Primer to comply with all federal standards for VOC, lead and chromate levels. Refer to Section 099100 - Painting.
- C. Finish Coating: Field apply intermediate and top coats per Section 099100 - Painting.

2.04 SHOP PRIMING

- A. Surface Preparation:
1. Provide surface preparations to meet SSPC-SP 6.
 2. Coordinate required surface profile with approved paint submittal prior to beginning surface preparation.
 3. Prior to blasting, remove any grease and oil using solvent cleaning to meet SSPC-SP 1.
 4. Remove weld spatter, slivers and similar surface discontinuities.
 5. Ease sharp corners resulting from shearing, flame cutting or grinding.

- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted with slip-critical connections.
 - 1. Extend priming of members partially embedded in concrete or mortar to a depth of 2 inches.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.05 GALVANIZING

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

2.06 MATERIALS

- A. General: Meet requirements of 051200 as amended below.
- B. Tension Control, High-Strength Bolts, Nuts, and Washers: Per section 051200, Tension Control Bolts. Provide standard carbon steel finish rounded bolt heads with twist off bolts; ASTM F3125/F3125M.

2.07 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 - 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 051200 for additional requirements.
 - 2. Quality assurance agency to review work for compliance with requirements of AISC 360, Chapter N and AISC 303, Section 10.
- C. AESS 1 and 2 Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.
- D. AESS 3,4, and C Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on approved mock-up. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 ERECTION

- A. AESS 1 and 2: Basic elements; feature elements not in close view:
 - 1. Employ special care to handle and erect AESS. Erect finished pieces using nylon straps or chains with softeners such that they are not damaged.
 - 2. Place weld tabs for temporary bracing and safety cabling at points concealed from view in completed structure or where approved by Architect during pre-installation meeting. Obtain Architect approval of methods for removing temporary devices and finishing AESS members prior to erection.
 - 3. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of AISC 303.
 - 4. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
 - 5. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
 - 6. Remove all backing and run out tabs.
 - 7. When temporary braces or fixtures are required to facilitate erection, take care to avoid any blemishes, holes or unsightly surfaces resulting from use or removal of such temporary elements.
 - 8. Bolted Connections: Align bolt heads on same side of connection as indicated on approved fabrication or erection documents.
 - 9. Welded Connections: Comply with AWS D1.1/D1.1M and Section 051200. Appearance and quality of welds to be consistent. Employ methods that will maintain alignment of members without warp exceeding tolerance of this section.
 - 10. Remove weld spatter exposed to view.
 - 11. Grind off projections larger than 1/16 inch at field butt and plug welds.
 - 12. Continuous Welds: Where continuous welding is noted on drawings, provide continuous welds of a uniform size and profile.
 - 13. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
 - 14. Splice members only where indicated.
 - 15. Obtain permission for any torch cutting or field fabrication from Architect. Finish sections thermally cut during erection to a surface appearance consistent with mock-up.
- B. AESS 3: Feature elements in close view:
 - 1. Erect to requirements of AESS 1 and 2 and as follows:
 - 2. Field Welding: Weld profile, quality, and finish to be consistent with mock-ups approved prior to fabrication.
 - 3. Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds.
- C. AESS 4: Showcase elements:

1. Erect to requirements of AESS 3 and as follows:
 2. Grind welds smooth.
 3. Minimize Weld Show Through: At locations where welding on far side of an exposed connection creates distortion, grind distortion and marking of steel to a smooth profile with adjacent material.
 4. Filling of Weld Access Holes: Where holes must be cut in web at intersection with flanges on W shapes and structural tees to permit field welding of flanges, fill holes with joint filler.
 5. Where welds are indicated to be ground, contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.
- D. -----
- E. Add modifications to characteristics included in AISC 303 matrix in order to modify one of the defined AESS categories and create a custom AESS C.
- F. -----
- G. AESS C: Custom elements:
1. Erect to requirements of AESS 1 and 2 and as follows:
 - a. _____.
 - b. _____.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Structural Requirements:
 1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 051200 for additional requirements.
 2. Quality assurance agency to review work for compliance with requirements of AISC 360, Chapter N and AISC 303, Section 10.
- C. AESS 1 and 2 Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.
- D. AESS 3,4, and C Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals as well as on approved mock-up. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

3.05 CLEANING

- A. Touch-up Painting: Complete cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint to blend with adjacent surfaces of AESS. Perform touch-up work in accordance with manufacturer's instructions and as specified in Section 099100 - Painting.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas. Repair galvanized surfaces in accordance with ASTM A780/A780M.
- C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION 051213

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Recycled Content: Provide products with a minimum post-consumer recycled content of 60%.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:

- a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Do not camber joists.
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
 - 1. Joist Type: LH-series steel joists.
 - 2. End Arrangement: Underslung.
 - 3. Top-Chord Arrangement: as indicated.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Do not camber long-span joists.
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- C. Primer: Provide shop primer that complies with Division 9.

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- C. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."
- D. Welding Electrodes: Comply with AWS standards.
- E. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and abutting structural steel and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.
3. Cellular, acoustical roof deck

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

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

- C. Product Test Reports: 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.
2. Acoustical roof deck.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

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

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

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

D. Recycled Content: Provide products with a minimum post-consumer recycled content of 75%.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

- C. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 3. Deck Profile: As indicated.
 4. Cellular Deck Profile: Long span, with bottom plate.
 5. Profile Depth: As indicated.
 6. Design Uncoated-Steel Thickness: As indicated.
 7. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 8. Span Condition: Triple span or more.
 9. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACOUSTICAL ROOF DECK

- A. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 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.
 7. Side Laps: Overlapped or interlocking seam at Contractor's option.
 8. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
 9. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
 - a. Factory install sound-absorbing insulation into cells of cellular deck.

10. Acoustical Performance: NRC 0.80 for 3" roof decks, NRC 0.70 for 1 ½" roof decks, tested according to ASTM C 423.

2.4 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 50, G60 zinc coating.
 2. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653 M, Structural Steel (SS), Grade 50, G60 Zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard baked-on, rust-inhibitive primer.
 3. Profile Depth: As indicated.
 4. Design Uncoated-Steel Thickness: As indicated.
 5. Span Condition: Triple span or more.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel Sheet, minimum yield strength of 50,000 psi, of same material and finish as deck; of profile indicated or required for application.
- G. 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.
- H. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch wide flanges and recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

- I. Galvanizing Repair Paint: ASTM A 780.
- J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.
- 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 weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.
- 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. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decks, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

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

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING – STRUCTURAL (CFSF-S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Interior non-load-bearing wall framing indicated as CFSF-S
 - 3. Soffit framing.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Power-actuated anchors.
 - 3. Mechanical fasteners.
 - 4. Vertical deflection clips.
 - 5. Horizontal drift deflection clips
 - 6. Miscellaneous structural clips and accessories.
- D. Evaluation Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. 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."

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. AllSteel Products, Inc.
- 2. Clark Steel Framing.
- 3. Consolidated Fabricators Corp.; Building Products Division.
- 4. Craco Metals Manufacturing, LLC.
- 5. Custom Stud, Inc.
- 6. Formetal Co. Inc. (The).
- 7. MarinoWare; a division of Ware Industries.
- 8. SCAFCO Corporation.
- 9. Southeastern Stud & Components, Inc.
- 10. Steel Construction Systems.
- 11. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

- a. Exterior Non-Load-Bearing Framing: Horizontal deflection of $1/360$ of the wall height. Maximum horizontal deflection of $1/600$ of the wall height where supporting brick veneer or GFRC.
 - b. Interior Non-Load Bearing Framing indicated as CFSF-S: Horizontal deflection of $1/360$ under a horizontal load of 5 lbf/sq. ft.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch.
 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- E. Recycled Content: Provide products with a minimum post-consumer recycled content of 25%.
- 2.3 COLD-FORMED STEEL FRAMING, GENERAL
- 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.
- 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.
- 2.4 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:

PENDER K-8 SCHOOL
PENDER COUNTY SCHOOLS
BURGAW, NORTH CAROLINA
Architect's Project No.: 631310

1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Flange Width: 1-5/8 inches.
 3. Depth: 8 inches, unless noted otherwise.
- 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: 0.0428 inch.
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0677 inch.
 2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0677 inch.
 - b. Flange Width: 1 inch plus the design gap for one-story structures.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0677 inch.
 - b. Flange Width: Dimension equal to sum of outer deflection track flange width plus 1 inch.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- 2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING DESIGNATED AS CFSF-S
- 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: 0.0428 inch.
 2. Flange Width: 1-5/8 inches.
 3. Depth: 3-5/8 inches, unless noted otherwise.
- 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: 0.0428 inch.
2. Flange width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

2.6 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428.
2. Flange Width: 1-5/8 inches, minimum.
3. Depth: 3-5/8 inches, minimum.

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

2.8 ANCHORS, CLIPS, AND FASTENERS

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

B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

C. 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.

D. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Shims: Load bearing, high-density multi-monomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies 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 steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that 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 load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 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 steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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 joints with cold-formed steel framing. Independently frame both sides of joints.

- H. Install insulation, specified in Section 072100 "Thermal 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 approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 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. Stud Spacing: 16 inches, unless noted otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 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, and fasteners, to provide a complete and stable wall-framing system.

3.5 INTERIOR NON-LOAD BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches, unless noted otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated on Shop Drawings.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 ERECTION TOLERANCES

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

3.7 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.

3.8 REPAIRS AND PROTECTION

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

END OF SECTION 054000

SECTION 054003
CONTINUOUS INSULATION (CI) FRAMING SYSTEM, CLIPPED

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- F. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
- G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- I. ASTM F594 - Standard Specification for Stainless Steel Nuts.
- J. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.
- K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Conduct pre-installation meeting at Project site before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
- B. Coordinate with work of other sections that is to be installed over, or anchored to, the continuous insulation (CI) framing system, including but not limited to structural anchors, claddings and cladding anchors, utilities, insulation, and firestopping.

1.03 DEFINITIONS

- A. Clipped Continuous Insulation (CI) Framing System: An engineered "fixing" system of framing designed to support building veneers on metal girts, transmitting all structural loads through insulation to the wall substrate via intermittent, thermally-isolated clips while maintaining required thermal performance of the wall.

1.04 SUBMITTALS

- A. Product Data: Provide product data for factory fabricated continuous insulation (CI) framing members and each accessory product.
- B. Shop Drawings: Indicate component details, including sizes, depths, and thicknesses of clips, girts, rails, and accessories or items required of related work.
 - 1. Indicate cladding joint layout, with CI framing system clip and girt layout and spacing coordinated for proper anchorage and support.

2. Indicate anchorage details including mechanical fasteners for securing CI framing system to primary structural wall element.
 - a. Indicate supplemental framing and reinforcing as required due to structural calculations.
3. Design Data: Include calculations for loadings and stresses of factory fabricated CI framing for project specific claddings and loadings, signed and sealed by a professional structural engineer.
- C. Thermal Modeling Report: Provide test data indicating reduction of R-value of continuous insulation due to framing penetrations. Test data shall demonstrate, at minimum, compliance with ANSI/ASHRAE 90.1 U-factor requirement for walls of construction indicated.
- D. Test Reports: Provide test reports performed by a qualified testing agency, for structural anchors, mechanical fasteners, framing clips, and accessories.
- E. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
- F. Designer's Qualification Statement.
- G. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design CI framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in exterior/envelope wall systems installation, experienced in the erection and installation of CI framing systems with a history of successful in-service use.

1.06 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. Prior to installation, store materials and components under cover in a dry, clean location.
- D. Protect CI framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

1.07 WARRANTY

- A. Warranty: Installer's warranty against failures in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion. Failures include structural cracks or punctures, material deterioration, and workmanship.
 1. Warranty Period: Two years beginning at the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Continuous Insulation (CI) Framing Systems:
 1. Aluminum Systems:
 - a. ECO Cladding; Alpha Vci / Hci.
 - b. GIP GmbH; VECO-A.
 - c. Hilti; FOX VI.
 - d. SFS intec Ltd. / NVELOPE Rainscreen Systems Ltd.; NV / NH2.

2. Steel Systems:
 - a. GIP GmbH; VECO-G.
 - b. Knight Wall Systems; MFI D-Series.
3. Substitutions: See Section 016000 - Product Requirements.

2.02 CONTINUOUS INSULATION (CI) FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
 - B. Design Requirements: Provide completed CI framing system, capable of supporting indicated exterior finish cladding(s) in a "rainscreen" design when anchored to indicated structural substrates. System shall consist of thermally isolated brackets supporting vertical girts. Where necessary due to cladding orientation or engineered design, vertical girts shall support horizontal rails. Design shall have the following characteristics:
 1. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
 2. Design Loads: Refer to Structural Drawings for wind and live loads.
 3. Spacing and types of girts and rails shall be as required by cladding manufacturer to support each indicated type of cladding.
 - a. Coordinate with cladding manufacturer(s) for dead loads of cladding system(s).
 - b. Coordinate with indicated joint layouts to ensure secondary girts are spaced to provide appropriate structural attachment for cladding(s).
 4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 5. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
 - C. Thermal Performance: System shall obtain effective R-value or U-factor indicated.
 1. Continuous framing profiles fully penetrating insulation are not allowed. Metal framing shall not thermally bridge exterior and interior except for fasteners.
 2. Framing assembly shall not reduce continuous insulation nominal R-value to less than 90% effective R-value.
 3. Continuous insulation framing system shall be thermally modeled to demonstrate, at minimum, compliance with ANSI/ASHRAE 90.1 maximum U-factor for walls.
 - D. Flatness: Installed system and components shall be flat within the tolerances allowable by cladding manufacturer; with no noticeable warping, buckling, deflections, or other surface irregularities that distort cladding.
 - E. Heat Resistance: All components that will come into contact with spray foam insulation shall be capable of exposure to the heat generated by spray foam installation without damage, including plastic washers and thermal spacers. Plastics and resins shall be rated for exposure to temperatures of 300 degrees Fahrenheit or more intermittently without loss of structural capacity or integrity.
 - F. Ventilation: System design shall allow for movement of air in the cavity behind the cladding, including compartmentalization and/or cross-ventilation for a pressure-equalized system where indicated.
 - G. Drainage: System design shall allow for drainage of moisture from the cavity behind the cladding.
 - H. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with Code of Standard Practice.
-

- I. Shop fabricate framing system to the greatest extent possible.
- J. Deliver to project site in largest practical sections.

2.03 CONTINUOUS INSULATION FRAMING MATERIALS

- A. Steel Framing: Either ASTM A792/A792M aluminum-alloy coated steel or ASTM A1046 zinc-aluminum-magnesium alloy coated steel.
- B. Aluminum Framing: ASTM B209/B209M, Alloy 6061-T6 for plate and sheet and ASTM B221, Alloy 6063-T6 for extrusions.
- C. Brackets: To suit girts and cladding system loads, and providing for field adjustment of girts to maintain plane of cladding. Provide fixed or floating type as required to accommodate expansion.
- D. Girts: As required to suit anchoring of perpendicular rails. Provide either vertical or horizontal girts as required due to indicated orientation of cladding.
 - 1. Perpendicular Rails: Subframing rails mounted to girts, to meet the requirements of cladding manufacturer for support and attachment at cladding ends and joints, and for regular spacing for attachment of claddings.

2.04 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Type 304 stainless-steel or zinc-plated with electrodeposition coating per ASTM B633 or ASTM F1941/F1941M.
- B. Anchorage Devices: Drilled expansion bolts or chemical anchors; Alloy Group 1 stainless steel per ASTM F593 for bolts and ASTM F594 for nuts.

2.05 ACCESSORIES

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION

- A. Install components in accordance with manufacturers' instructions.
- B. Attach primary brackets prior to application of spray foam insulation/air barrier. Install brackets true to line with secure connections to primary structural components, at spacing required by load calculations and as indicated on Shop Drawings.
- C. After installation of spray foam insulation/air barrier, remove only amount needed for attachment of secondary girts/rails and cladding support anchors. Notify spray foam installer if amount of material removed affects wall's insulating or air/vapor barrier performance, or if touch up is required.
- D. Install framing girts/rails plumb, square, and true to line, with securely fastened connections.
 - 1. If cutting is required, cut by sawing or shearing, do not torch cut. Protect adjacent surfaces from sparks.
 - 2. Fasten CI framing members by screw fastening. Locate all mechanical fasteners as indicated on Shop Drawings.

3. Locate screws at slotted holes to allow for expansion and contraction in the CI framing system design.
4. Each girt shall be supported by at least two primary support brackets.
5. Do not bridge building expansion joints with CI framing. Independently frame both sides of joints.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch, unless otherwise indicated by cladding manufacturer.

3.04 REPAIR AND PROTECTION

- A. Touch up shop-applied coatings as required if damaged during handling or installation.
- B. After installation of primary support brackets, inspect substrates for damage and repair substrate flashings or membranes as required.
- C. Provide fine adjustments to CI framing as required immediately prior to cladding installation to verify that tolerances are maintained. Prepare CI framing in a timely manner to avoid excessive UV exposure to substrate membranes, air barriers, and other materials.
- D. Provide final protection of CI framing as required to ensure that CI framing system is without damage or deterioration prior to installation of cladding.

END OF SECTION 054003

**SECTION 055000
METAL FABRICATIONS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- L. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- M. NAAMM MBG 531 - Metal Bar Grating Manual.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 SUBMITTALS

- A. Product Data: Provide product data for factory fabricated products and accessory materials, including the following:
 - 1. Stair nosings.
 - 2. Nonslip finishes.
 - 3. Nonshrink grout.
 - 4. Shop primer paint products.
 - a. Coordinate with Division 9 Painting topcoat manufacturer and provide compatibility certificates from topcoat manufacturer that shop primers are acceptable substrate for specified topcoats.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Include field measurements, and indicate where field measurements differ from documents.
2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gauges.
 - 4) Details of connections.
 - 5) Support reactions.
 - 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.

1.03 QUALITY ASSURANCE

- A. Design mechanical supports and miscellaneous steel shapes 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. Field Measurements: Take field measurements prior to fabrication and verify that dimensions and tolerances are acceptable for fabricated products to fit the space. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials, General: Provide metal fabrications and components with finished surfaces that are smooth and flat. Metal fabrications and components shall not have labels, stickers, engraved or rolled manufacturer names, seams, or blemishes that are exposed in the finished work.

2.02 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Fittings: ASTM A1011/A1011M.
- F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
 1. Provide stainless steel fasteners for all exterior construction and for fastening aluminum and stainless steel fabrications.
 2. Provide stainless steel fasteners at areas subject to moisture or steam, including mechanical rooms, janitor/custodial rooms with floor sinks, and similar spaces.
 3. Provide zinc-plated fasteners for interior construction except where stainless steel is indicated.

- G. Bolts, Nuts, and Washers: ASTM A307, Grade A, 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, universal shop primer, 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.

2.03 MATERIALS - ALUMINUM

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

2.04 FABRICATION

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

2.05 FABRICATED ITEMS

- A. Metal Ladders: Refer to Section 055133 - Metal Ladders.
 - B. Bollards: Schedule 40 steel pipe, concrete filled, crowned cap, as detailed; nominal 6-inch diameter unless otherwise indicated; prime paint finish.
 - 1. In lieu of field formed crowned cap, Contractor may at its option provide precast, symmetrically domed caps.
 - C. Catwalk: Fabricate steel plate and other components specified in Division 05 Section "Structural Steel Framing" for catwalk assembly.
 - D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and masonry; prime paint finish.
 - E. Lintels: As detailed; prime paint finish.
 - F. Door Frames for Overhead Door Openings and Wall Openings: Channel or bent plate sections; prime paint finish.
 - G. Operable Partition Support: Provide steel beam or other shape as acceptable to operable partition manufacturer, along length of operable partition; coordinate with manufacturer to size beam to prevent sag.
 - H. Elevator Hoist Beams: Beam sections; prime paint finish.
 - I. Elevator Sills: Provide angle shapes for slab edge locations and elevator sill supports; size in coordination with elevator manufacturer's requirements.
 - J. Slotted Channel Framing: Fabricate channels and fittings from ASTM A1011/A1011M, Grade 33 structural steel complying with the referenced standards; with factory-applied, rust-inhibiting thermoset acrylic enamel finish.
 - 1. Provide 1-5/8 inch by 1-5/8 inch channel unless otherwise indicated.
 - K. Bar Gratings: NAAMM MBG 531, welded or pressure-locked galvanized steel type. For all gratings, unless otherwise indicated, provide manufacturer's standard galvanized cross rods or bars spaced at 4 inches o.c.
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1. Elevator Sump Grating: Removable; type W-19-4 or P-19-4 per MBG 531; minimum 1-inch high by 1/8-inch thick galvanized steel bearing bars, spaced approximately 1-3/16-inch o.c.
 2. Walkway Gratings (Non-ADA): Type W-19-4 or P-19-4 per MBG 531; 1-1/4-inch high by 3/16-inch thick galvanized steel bearing bars, with bearing bars spaced 1-3/16 inches on center.
 3. Provide welded frames for bar gratings, fabricated of galvanized steel shapes, with integral anchors/lugs for casting into concrete.
- L. Miscellaneous Steel Shapes: Provide steel shapes for miscellaneous applications indicated on drawings, including but not limited to, reinforcing steel shapes at low partitions/knee walls and concrete slab edge angles.

2.06 FACTORY FABRICATED STAIR NOSINGS

- A. Factory Fabricated Stair Nosings: For casting into concrete stairs.
1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.
 - a. Tread Abrasive Filler: Aluminum-oxide epoxy-bonded to tread base.
 - b. Tread Type: Ribbed bar.
 - c. Nosing Types: Angled long nose for sloped stairs.
 - d. Color: Black.
 - e. Depth: 3 inches nominal.
 2. Manufacturers:
 - a. Balco, Inc.; R-315PC.
 - b. Nystrom, Inc; Ribbed Bar Nosing with EcoTread (STSB-ECO).
 - c. Wooster Products, Inc.; Type 231BF.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.07 FINISHES - STEEL

- A. Prime paint steel items.
1. Exceptions: Galvanize and do not prime items to be embedded in concrete and items to be embedded in masonry. Do not prime items to be embedded in sprayed fireproofing.
- B. Prepare interior items to be primed in accordance with SSPC-SP3 Power Tool Cleaning.
- C. Prepare exterior items to be primed, and interior items to receive specialty protective coating such as zinc-rich primer, in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning.
- D. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- E. Prime Painting: One coat.
- F. Galvanizing: Galvanize after fabrication to ASTM A123/A123M requirements.
- G. Slotted Channel Framing: ASTM A1011/A1011M Grade 33; coated with manufacturer's standard rust-inhibitive acrylic enamel.

2.08 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I color anodized.
- B. Apply corrosion protection coating to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.09 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 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. Furnish 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. Perform field welding in accordance with AWS D1.1/D1.1M.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- F. Installation of Nosings: Center nosings on stair width with 4 inch inset at each end. Embed nosings in wet concrete, flush to top of each tread and aligned to front edge of each riser. Coordinate with concrete installer to tool concrete around the nosings for a smooth, clean finish. Remove protective masking tape after concrete has set and cured and clean any concrete residue.
- G. Installation of Bollards: Anchor bollards in concrete footings to a minimum depth of 36 inches with 6 inches of concrete below bottom of bollards. Fill bollards with concrete.
 - 1. At Contractor's option, provide either precast caps secured to wet concrete fill, or field-mound wet concrete fill to form a rounded cap.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055000

**SECTION 055100
METAL STAIRS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- I. 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.
- J. 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.
- K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- L. 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.
- M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for metal stairs.
 - 1. Provide data for shop primer and for nonshrink grout.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Design Data: Include delegated-design shop drawings, including structural calculations and details for loadings and stresses, and anchors and connections.
3. 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 no more than 12 months before start of scheduled welding work.
- D. Designer's Qualification Statement.

1.03 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 in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.
- C. Indoor Emissions: For each type of paint and coating, comply with the emissions requirements of California Department of Public Health (CDPH); "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers."
- D. VOC Content: For each type of paint and coating, comply with VOC content restrictions as required by 40 CFR 59, Subpart D (EPA's "National Volatile Organic Compound Emission Standards for Architectural Coatings").

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - a. Head Clearance: Maintain a minimum of 80 inches head clearance along all paths of travel (the "walk line") as measured above stair noses or finished walking surfaces.
 2. Structural Design: Provide complete stair and railing assemblies that comply with the following:
 - a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/360 of span.
 - 1) Deflection shall not exceed 1/720 of span where brittle finish materials such as stone, ceramic tile, or terrazzo are indicated.
 - b. Railing Assemblies: Refer to Division 5 "Pipe and Tube Railings."
 3. Dimensions: As indicated on drawings.
 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 6. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels, per NAAMM AMP 510 "Metal Stairs Manual":
 1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.

- a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
 - b. Welds Exposed to View: Ground smooth and flush.
 - c. Mechanical Joints: Butted tight, flush, and hairline.
 - d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
 - e. Exposed Edges and Corners: Eased to small uniform radius.
 - f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Commercial, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
- 1. Concrete Depth: 1-1/2 inches, minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
 - 4. Concrete Reinforcement: Welded wire mesh.
 - 5. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
- 1. Nosing Depth: Not more than 1-1/2 inch overhang.
 - 2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
- 1. Stringer Depth: 10 inches.
 - 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Railings: Steel pipe railings.

2.03 HANDRAILS AND GUARDS

- A. Handrails and Guards: See Section 055213.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.
- E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
- 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.
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- G. Reinforced Concrete Fill: Refer to Section 033000.

2.05 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Shop and Touch-Up Primer: SSPC-Paint 15 or MPI #79, compatible with topcoat indicated in Division 9 Section "Painting," and comply with VOC limitations of authorities having jurisdiction.
 - 1. At exterior and galvanized surfaces, provide zinc-rich primer; SSPC-Paint 20 or MPI #20, compatible with topcoat, and VOC-compliant.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 or MPI #20, compatible with topcoat, and comply with VOC limitations of authorities having jurisdiction.
- E. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 055100

**SECTION 055133
METAL LADDERS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- K. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- L. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- P. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).
- R. SSPC-SP 2 - Hand Tool Cleaning.

1.02 SUBMITTALS

- A. 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.
- B. 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.
- C. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

- A. Design ladders 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.

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. 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, galvanized to ASTM A153/A153M where connecting galvanized components.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Steel, galvanized to ASTM A153/A153M.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 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: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
 3. Finish: Mill finish aluminum.
 4. Manufacturers:
 - a. Alaco Ladder Company.
 - b. O'Keeffe's Inc; Model 500.
 - c. Precision Ladders, LLC; Fixed Aluminum Wall Ladder.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 2. Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
 3. Incline: 60 degrees.
 4. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.
 5. Manufacturers:
 - a. Alaco Ladder Company; H60 - 60 Degree Ships Ladder (Hatch).
 - b. O'Keeffe's Inc; Model 523A.
 - c. Precision Ladders, LLC; Aluminum Ship Stairs to Roof Hatch (SL-01).

2.05 FINISHES - STEEL

- A. Prepare surfaces to be primed in accordance with SSPC-SP2.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I natural anodized.
- B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION TOLERANCES

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

PART 3 EXECUTION

3.01 EXAMINATION

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

- B. Masonry Walls: Confirm that masonry wall assemblies provide adequate structural support for anticipated ladder loads.
- C. Metal Framed Walls: Confirm that blocking and reinforcing have been installed in appropriate locations in the wall assembly to provide adequate structural support for anticipated ladder loads.

3.02 PREPARATION

- A. 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 shop 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.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055133

**SECTION 055213
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- E. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for pipe and tube railings.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design Data: Include delegated-design shop drawings, including structural calculations and details for loadings and stresses, and anchors and connections.
 - 3. 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.

1.03 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. Indoor Emissions: For each type of paint and coating, comply with the emissions requirements of California Department of Public Health (CDPH); "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers."

- D. VOC Content: For each type of paint and coating, comply with VOC content restrictions as required by 40 CFR 59, Subpart D (EPA's "National Volatile Organic Compound Emission Standards for Architectural Coatings").

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. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
- F. Provide brackets, flanges, 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 or solid masonry, provide brackets anchored with drilled in expansion shields and hanger or lag bolts.
 - 2. For anchorage to hollow masonry, provide brackets anchored with toggle bolts.
 - 3. For anchorage to stud walls, provide brackets anchored with hanger or lag bolts to fire-retardant-treated wood blocking, or with toggle bolts to steel reinforcing backing plates.
 - a. Coordinate anchorage locations with Division 6 "Rough Carpentry" and / or Division 9 "Cold-Formed Steel Framing - Non-Structural (CFSF-NS)" to provide blocking or backing plates in framed walls, as applicable.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
 - B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.
 - C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
 - D. Exposed Fasteners: No exposed bolts or screws.
 - E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 - F. Shop and Touch-Up Primer: SSPC-Paint 15 or MPI #79, compatible with topcoat indicated in Division 9 Section "Painting," complying with VOC limitations of authorities having jurisdiction.
 - 1. At exterior and galvanized surfaces, provide zinc-rich primer; SSPC-Paint 20 or MPI #20, compatible with topcoat, and VOC-compliant.
 - G. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
-

2.03 FABRICATION

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

PART 3 EXECUTION

3.01 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. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055213

**SECTION 061000
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. AWWA U1 - Use Category System: User Specification for Treated Wood.
- H. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- I. EPA (TSCA); Title VI - Toxic Substances Control Act, Title VI: Formaldehyde Standards for Composite Wood Products.
- J. PS 1 - Structural Plywood.
- K. PS 20 - American Softwood Lumber Standard.
- L. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 SUBMITTALS

- A. Product Data: Provide technical data for fire-retardant materials, wood preservative materials, and include certification that materials and treatment comply with manufacturer's requirements.
 - 1. Evaluation Reports: Provide ICC-ES evaluation reports for each applicable item below:
 - a. Preservative-treated lumber.
 - b. Fire-retardant-treated lumber.
 - c. Each type of engineered wood.
 - d. Shear panels.
 - e. Each type of power- or powder-actuated fastener and expansion anchor.
 - f. Structural wood connectors (framing anchors).

1.03 QUALITY ASSURANCE

- A. Testing Agency Qualifications (for Fire-Retardant Treatments): Independent firm specializing in performing testing of treatments of type specified in this section, and performing periodic inspections to ensure that the material receiving the classification marking matches the tested material; and approved by local authority having jurisdiction.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. Grading Agencies: 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.
 - a. Northeastern Lumber Manufacturer's Association (NELMA) - Spruce-Pine-Fir.
 - b. Southern Pine Inspection Bureau (SPIB) - Southern Pine.
 - c. West Coast Lumber Inspection Bureau (WCLIB) - Douglas Fir, Hem Fir, Spruce-Pine-Fir-South.
 - d. Western Wood Products Association (WWPA) - Douglas Fir, Hem Fir; Spruce-Pine-Fir-South.
 - e. National Lumber Grades Authority (NLGA) - Douglas Fir-North, Hem Fir-North, Spruce-Pine-Fir.
 2. Provide lumber stamped with grade mark of responsible grading agency, unless otherwise indicated.
 - a. Place grade stamp on unexposed surface of lumber specified to be exposed with natural or stained finish, or omit grade stamp and submit documentation from grading agency certifying grade compliance.
 3. Species and Grade:
 - a. Species and grade is indicated on Structural Drawings for studs, joists, rafters, beams, columns, ceiling joists, and other structural components, as applicable.
 - b. For miscellaneous lumber including non-structural miscellaneous framing, blocking, nailers, grounds, and furring, provide No. 2 or Standard grade.
 - c. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
 4. Moisture Content: S-dry or MC19 (19% or less). Applies to lumber for 2-inch nominal thickness and less.
- B. Composite Wood: Any composite wood materials installed inside the weatherproofing system shall meet either EPA (TSCA); Title VI for ultra-low-emitting formaldehyde or no added formaldehyde (ULEF / NAUF).

2.02 WOOD CONSTRUCTION PANELS

- A. Roof Nailer (Top of Parapets): Exposure 1, veneer faced FRT plywood sheathing. OSB is not acceptable.
1. Thickness: Minimum 5/8 inch.
 2. Screws for fastening plywood sheathing over blocking & rigid insulation at top of parapets:
 - a. For Steel Framing: Provide #10 SIP low profile flat head or pancake head screws intended for wood-to-metal connections, at spacing indicated.
 - 1) Pullout Capacity: 108 lb minimum in 43 mil (18 gauge) steel.
 - b. For Solid/Grouted Solid Masonry: 1/4-inch diameter, low-profile flat head type concrete screw anchors at 3 inches from each panel edge, and at spacing indicated. Length to suit embedment into CMU of 1-1/4 inches, minimum.
 - 1) Pullout Capacity: 100 lb minimum at 1 inch embedment in face shell of hollow CMU.

- B. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 1/2 inch.
 - 1. At Assemblies Indicated with Fire-Rating: Use 5/8 inch Type X, required by indicated tested assembly.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Edges: Square.
 - 4. Products:
 - a. CertainTeed Corporation; GlasRoc Brand.
 - b. Georgia-Pacific Gypsum; DensGlass Sheathing.
 - c. National Gypsum Company; Gold Bond eXP Sheathing.
 - d. USG Corporation; Securock Brand Glass-Mat Sheathing.
 - e. Substitutions: See Section 016000 - Product Requirements.
- C. Composite Wall Sheathing (rear of P: Plywood construction panel laminated to insulation board).
 - 1. Construction Panel: 3/4 inch (19 mm) CDX plywood; fire-retardant treated. Oriented strand board (OSB) is not acceptable.
 - 2. Insulation Board: Polyisocyanurate foam plastic with glass fiber mat facer on major surface opposite construction panel; 2 inch thickness unless otherwise indicated.
 - 3. Products:
 - a. Atlas Roofing Corporation; ACFoam Nail Base.
 - b. Carlisle Coatings & Waterproofing, Inc; R2+ Base.
 - c. Hunter Panels; Xci Ply.
 - d. Rmax Inc; ECOMAXci FR Ply.
 - e. Substitutions: See Section 016000 - Product Requirements.
 - 4. Screws for composite sheathing over gypsum based wall sheathing to steel framing:
 - a. For Steel Framing: Provide #10 SIP low profile flat head or pancake head screws intended for wood-to-metal connections, at spacing indicated.
 - 1) Pullout Capacity: 108 lb minimum in 43 mil (18 gauge) steel.
- D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 25 or less, when tested in accordance with ASTM E84 (Class A - UL FR-S).

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Provide hot-dipped galvanized steel complying with ASTM A 153 or stainless steel at exterior, high humidity, and preservative-treated wood locations.
 - a. Fasteners at interior FRT shall be per FRT treatment manufacturer's recommendations.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry.
 - 4. Screws/Anchors for Fastening Top-of-Parapet Blocking & Nailers and for Back-of-Parapet Composite Plywood Sheathing over Rigid Insulation:
 - a. For CFSF-S Metal Framed Parapets: Provide #10 SIP low profile flat head screws intended for wood-to-metal connections, at spacing indicated. Pullout capacity of 108 lb minimum in 43 mil (18 gauge) steel.

- b. For CMU Parapets: Provide 1/4-inch diameter low-profile flat head type concrete screw anchors, at spacing indicated. Length to suit embedment into CMU of 1-1/4 inches minimum. Pullout capacity of 100 lb minimum at 1 inch embedment in face shell of hollow CMU.
- B. Flexible Flashing/Separation Material: Barrier sheet fabricated of polyethylene backed rubberized asphalt or butyl rubber sheet; not less than 25 mil overall thickness.
- C. General Purpose Construction Adhesives: Comply with ASTM C557 or ASTM D3498.
 - 1. Adhesives: Adhesives field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.04 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Provide FRT lumber and plywood stamped with name and mark of qualified testing agency, fire-retardant treatment product and manufacturer, wood species and drying method, testing standards, and flame spread and smoke development indices.
 - a. For exterior FRT and FRT that will be exposed to moisture, include accelerated weathering test language, with the words "No increase in the listed classification when subjected to Standard Rain Test ASTM D2898".
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 and maximum smoke developed index of 450, when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat exterior rough carpentry items associated with roof construction, concealed blocking, and as indicated on Drawings.
 - c. Do not use treated wood in direct contact with the ground.
 - 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 and maximum smoke developed index of 450, when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat interior concealed blocking, plywood backing panels, and other rough carpentry items as indicated.
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
 - 3. Strength Adjustments (Structural Panels/Plywood): Test FRT structural panels/plywood per ASTM D 5516 and develop strength adjustment factors per ASTM D 6305.

4. Strength Adjustments (Lumber): Test FRT lumber per ASTM D 5664 and develop strength adjustment factors per ASTM D 6841.
- C. Preservative Treatment:
1. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA). Do not use lumber or plywood treated with inorganic boron (SBX) for applications exposed to water, ground/soil contact, or interior floor slabs/concrete. Comply with additional treatment restrictions as required by local authorities having jurisdiction.
 2. Preservative Pressure Treatment of Lumber & Plywood Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Use Category UC2 is acceptable for interior lumber and plywood above grade (not in contact with floor slab).
 - b. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - c. Treat lumber exposed to weather.
 - d. Treat lumber in contact with roofing, flashing, or waterproofing.
 - e. Treat lumber in contact with masonry or concrete.
 - f. Treat lumber less than 18 inches above grade, and lumber located directly against below-grade exterior walls.
 - g. Treat lumber in other locations as indicated.
 3. Preservative Pressure Treatment of Lumber in Contact with Ground/Soil: AWP A U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

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 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 metal-framed walls, provide continuous FRT blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In metal-framed 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.
- D. Where PPT blocking is indicated to be installed directly adjacent to metal decking or other galvanized metals, provide flexible flashing/separation material as a continuous barrier to prevent direct contact between materials.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Top-of-Parapet Blocking and Nailers: Secure wood blocking and plywood nailers to prepared substrate using mechanical fasteners to attain loading design requirements. Adhesive anchorage of wood nailers & blocking is not acceptable. Coordinate with installation of continuous insulation and air barrier membrane/roof membrane materials.
 - 1. Installation at CMU Parapets: Secure parapet blocking and nailers to CMU with screw anchors in two rows, staggered, at 32 inches on center; except within 10 feet of building corners provide two staggered rows at 24 inches on center. Provide fasteners sized for embedment length into CMU of 1-1/4 inch, minimum. Install screws in accordance with manufacturer's instructions, with screw heads flush with uppermost surface off indicated blocking or plywood nailer.
 - 2. Installation at CFSF-S Metal Framed Parapets: Secure blocking and nailers to metal framing at #10 SIP screws in 2 rows at 16 inches on center; except within 10 feet of building corners provide 2 rows at 12 inches on center. Provide attachment in accordance with APA Form No. T625C, Table 1; for 3/4 inch plywood thickness, wall stud spacing, and wind exposure category indicated.
- C. Back-of-Parapet Composite Sheathing Over Rigid Insulation: Secure composite sheathing to prepared substrate using mechanical fasteners to attain loading design requirements. Adhesive anchorage is not acceptable. Coordinate with installation of air barrier membrane/roof membrane materials.
 - 1. Stagger vertical butt joints.
 - 2. Installation at CFSF-S Metal Framed Parapets: Secure sheathing anchored directly to CFSF-S framing with #10 SIP screws. Fastener spacing shall be 16 inches horizontally and 8 inches vertically; verify with spacing of installed CFSF locations in field.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws as indicated.
 - 1. Screw panels to cold-formed steel framing.
 - 2. Space panels 1/8-inch apart.
- B. Communications and Electrical Room Mounting Boards: Secure with screws, to furring or to framing as applicable, with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.06 CLEANING

- A. Waste Disposal: Refer to 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.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- 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 061000

SECTION 064100
ARCHITECTURAL WOODWORK AND CASEWORK

PART 1 GENERAL

1.01 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.02 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.
- C. ANSI A208.1 - American National Standard for Particleboard.
- D. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. AWI (QCP) - Quality Certification Program.
- G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
- H. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.
- I. BHMA A156.9 - Cabinet Hardware.
- J. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- K. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- L. EPA (TSCA); Title VI - Toxic Substances Control Act, Title VI: Formaldehyde Standards for Composite Wood Products.
- M. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- N. NEMA LD 3 - High-Pressure Decorative Laminates.
- O. SCAQMD 1113 - Architectural Coatings.
- P. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
 - 1. Include product data for each type of hardware and accessory.

- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Include field measurements, and indicate where field measurements differ from documents.
- C. Selection Samples: Submit manufacturer's color charts indicating full range of available colors, for each product requiring color selection.
- D. Fabricator Qualifications: Include evidence of accreditation with quality control program.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with experience on Projects of similar size and scope.
 - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
 - 2. Single Source Responsibility: Provide and install this work from single fabricator.
 - a. It is acceptable to subcontract portions of the work to a separate specialty subcontractor (for example, pre-fabricated plastic-laminate-faced casework); however, each fabricator shall be independently accredited; submit accreditation for each fabricator. The primary woodworking contractor shall be responsible for ensuring the work of all Division 06 sections is well coordinated and properly fabricated and installed.
- B. Quality Certification:
 - 1. Comply with AWI (QCP) woodworking association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - a. This AWI (QCP) project is registered as project number 23.1635.
 - 2. Provide for third-party AWI final inspection of fabricated architectural casework (prior to delivery). AWI program of self-certification in lieu of third-party inspection is not acceptable.
 - 3. Provide for third-party AWI final inspection of field-installed woodwork (after installation). AWI program of self-certification in lieu of third-party inspection is not acceptable.
 - 4. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 - 5. Provide designated labels on shop drawings as required by certification program.
 - 6. Provide designated labels on installed products as required by certification program.
 - 7. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 8. Replace, repair, or rework all work for which certification is refused.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 2 of the Architectural Woodwork Standards: "Care & Storage."
- B. Deliver woodwork after finishes are complete, including painting, and HVAC is operating at occupancy conditions in all spaces where woodwork will be installed.
- C. Store in an environmentally controlled location. Protect units from moisture damage.

1.07 FIELD CONDITIONS

- A. During and after installation of woodwork, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.
-

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84, unless otherwise indicated for specific products.
- C. All countertop surfaces shall be NSF approved for food contact.
- D. Accessibility Requirements: Fabricate and install woodwork and casework in compliance with ICC/ANSI A117.1 and with ADA Standards for Accessible Design.
- E. Low-Emitting Materials:
 - 1. Composite Wood: Any composite wood materials installed inside the weatherproofing system shall meet either EPA (TSCA); Title VI for ultra-low-emitting formaldehyde or no added formaldehyde (ULEF / NAUF).
 - 2. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
 - 3. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.02 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic-Laminate-Clad Cabinets: Custom grade, except as modified below. Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
 - 1. Style: Reveal overlay. Ease doors and drawer fronts slightly at edges.
 - 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 - a. Base Cabinets: 24 inches.
 - b. Tall Cabinets: 24 inches.
 - c. Wall Cabinets: 12-1/2 inches. (Minimum clear interior depth shall be 11 inches)
 - 3. Drawer Construction: Provide AWI premium grade for drawer box construction.
 - 4. Base Construction: Provide adjustable levelers for all base cabinets to facilitate load transfer to the floor, isolate cabinet ends from the floor, and permit leveling.
 - a. Provide one of the following two types of base construction:
 - 1) Separate Sub-Base: Cabinet sub-base shall be separate and continuous (no cabinet body sides-to-floor), exterior grade plywood with concealed fastening to cabinet bottom. Sub-base shall be ladder-type construction of individual front, back, and intermediates, to form a secure and level platform to which cabinets attach. Recess sub-base at exposed cabinet end panels 1/4 inch from face of finished end, for flush installation of finished base material by other trades.
 - 2) Integral Base: Provide end panels, cabinet bottoms, and horizontal toe kick members integrally joined together for structural strength. Adjustable levelers shall be provided at each corner for each cabinet.

- b. Toe Kick: Toe kick shall be nominal 4 inch height. Reduce as necessary via field modification due to construction tolerances and concrete slab levelness to maintain maximum height dimensions indicated.
- 5. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: To be selected by Architect from manufacturer's full range.
 - 1) Linear patterns must all run in the same direction
 - c. Exposed Interior Surfaces: Thermally fused laminate (melamine) is acceptable only at drawer boxes. Provide HPDL, type VGS or CLS, at semi-exposed interiors of cabinets (cabinets with doors). Provide type VGS for exposed interior horizontal shelving surfaces and interiors of open cabinets (no doors).
 - d. Apply undecorated laminate backing sheet to concealed reverse side of plastic laminate finished surfaces.
 - e. Wood Grain Pattern: If wood grain is indicated or selected for plastic laminate color/pattern, provide sequence matched finish across each elevation. Grain shall run vertically across all doors, drawers, fronts, and false fronts; mismatched grain direction is not allowed.
- C. ADA Sink Cabinets: Fabricate a panel of 3/4-inch moisture resistant core material and veneer/cladding material to match adjacent cabinets. Panel shall be removable for service access to undercounter plumbing. Provide with Z-clip attachment system for concealed fastening and with a steel cable retainer, minimum 4 feet long, so that panel can be set aside for service access. Fasten Z-clips and steel cable retainer to panel and to substrate with tamper-resistant fasteners.
 - 1. Provide an undercounter vertical "apron" piece at front of ADA sink locations as indicated, flush to fronts of adjacent cabinets and finished to match.
- D. ADA Sink Cabinets: Provide casework manufacturer's standard hinged front door panels, with matching veneer/cladding material and toe kick built into door panels, to match appearance of adjacent base cabinets. Front door panels swing open to 160 degrees minimum to allow for ADA-compliant undercounter knee space and for plumbing access to sink.

2.03 WOOD-BASED COMPONENTS

- A. Low-Emitting Materials: Provide composite wood products that meet the requirements of EPA (TSCA); Title VI for formaldehyde emissions.
- B. Core Material for Cabinets: ANSI A208.1, Grade M-2 particleboard.
 - 1. At Contractor's option, cabinet backs may be fabricated of ANSI A208.2, Grade MD fiberboard.
- C. Core Material for Countertops: Manufacturer's standard ANSI A208.1, Grade M-2 particleboard, or ANSI A208.2, Grade MD fiberboard.
 - 1. At countertops containing sinks, provide core material meeting ANSI MR10 for moisture resistance. Available Products:
 - a. Arauco North America; Duraflake VESTA Moisture Resistant ULEF.
 - b. Collins Pine; FreeForm.
 - c. Georgia-Pacific; Ultrastock MR MDF.
 - d. Roseburg Forest Products; SkyBlend MR-10.

2.04 PANEL CORE MATERIALS

- A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
- B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.

2.05 THERMALLY FUSED LAMINATE PANELS

- A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
 - 1. Test in accordance with NEMA LD 3 Section 3.
 - 2. Panel Core Substrate: Particleboard.
 - 3. Color: White.

2.06 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation; High Pressure Laminate.
 - 2. Panolam Industries International, Inc; Nevamar Standard HPL.
 - 3. Panolam Industries International, Inc; Pionite Standard HPL.
 - 4. Wilsonart LLC; High Pressure Laminate (HPL).
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Color and Pattern: To be selected by Architect from Manufacturer's full range (standard and premium colors) in standard textured finish (textured gloss, fine textured, or suede finish). High gloss, heavy textured, metallic, or other special surface products (abrasion-resistant, chemical-resistant) will not be required for use in this project.
- D. Provide specific types as follows:
 - 1. Horizontal Countertop Surfaces: HGS, 0.048 inch (1.2 mm) nominal thickness.
 - 2. Vertical Surfaces and Non-Countertop Horizontal Surfaces: VGS, 0.028 inch (0.7 mm) nominal thickness.
 - 3. Cabinet Liner: CLS, 0.020 inch (0.5 mm) nominal thickness.
 - 4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.07 SOLID SURFACING MATERIAL

- A. Solid Surfacing Material: ISFA 2-01.
 - 1. Products:
 - a. E. I. du Pont de Nemours and Company; Corian.
 - b. Formica Group; Solid Surfacing.
 - c. LG Hausys America; HI-MACS.
 - d. Wilsonart LLC; Solid Surface.
 - e. Meganite
 - 2. Thickness: 1/2-inch.
 - 3. Type: Standard Type.
 - 4. Color and Pattern: To be selected by Architect from manufacturer's full range.
 - 5. Color and Pattern: Provide colors per the following:

- a. Colors and Patterns for Countertops: As selected by Architect from manufacturer's full range
- b. Colors and Patterns for Window Stools: As selected by Architect from manufacturer's full range

2.08 COUNTERTOPS

- A. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade and with manufacturer's requirements.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 - 2. Core: Particleboard or fiberboard as specified, except provide moisture resistant type at sink locations.
 - 3. Exposed Edge Treatment: Square, substrate built up to 1-1/2 inch thick unless otherwise indicated; covered with 3 mm edge banding with eased ends.
 - 4. Back and End Splashes: 3/4-inch thick core material with Grade HGS face and 0.5 mm edge banding/tape at edges.
- C. Solid Surfacing Countertops and Window Stools: Solid surfacing sheet or plastic resin casting over structural substrate/core material.
 - 1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - 2. Core: Fabricate solid surface countertop core of manufacturer's recommended moisture-resistant MDF. Provide continuous structural substrate at unsupported/overhang conditions; ladder construction acceptable over cabinets. Build up core material for total countertop thickness indicated.
 - 3. Fabricate in accordance with manufacturer's standard requirements, and in one piece to the greatest extent possible.
 - a. Shop-fabricate cutouts and holes in solid surface for plumbing fixtures, deck-mounted soap dispensers, and other items indicated on Drawings.
 - 4. Provide manufacturer's standard configuration for exposed edges, back and end splashes, and per the requirements below:
 - a. Edge and Corner Profiles: Eased.
 - b. Provide built up edges to standard thickness indicated (1-1/2 inches unless otherwise indicated).
 - c. Provide 4 inch high back and end splashes, unless otherwise indicated.
 - 5. Window Stools: Scribe window stools to fit jamb conditions as indicated.

2.09 ACCESSORIES & ACCESSORY MATERIALS

- A. Adhesive: Type recommended by fabricator to suit application.
 - B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; of width to match component thickness.
 - 1. Provide 3 mm edge banding at all door and drawer front edges and laminate countertop edges.
 - 2. Provide 0.5 mm edge banding (tape) at cabinet body edges, shelf edges, and other semi-exposed/exposed interior edges.
 - 3. Color: To be selected by Architect from Manufacturer's full range.
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- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, color as selected by Architect from manufacturer's full range.
 - 1. Grommet Size: To fit 2-1/2 inch diameter cut-out, nominal, unless otherwise indicated.
 - 2. Grommets shall have removable caps and slot for wire passage.
- F. Undercounter Wire Management: Provide the following, as indicated:
 - 1. Vinyl J-shaped channel wire manager for undercounter mounting, continuous for full length of countertop.
- G. Mailroom Casework Modules: Modular paper sorting assembly of closed-back, open-front case modules with adjustable horizontal shelves, fabricated of fire-resistant, impact-resistant, high-strength plastic or coated steel. Provide manufacturer's standard module sizes for overall unit dimensions and mail slot quantity required. Provide with metal nameplate at each mail slot.

2.10 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
 - B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated shelf rests, polished chrome finish, for nominal 1 inch spacing adjustments.
 - C. Workstation Brackets: Fixed, L-shaped, corner reinforced, face-of-stud mounting. Provide at all countertop/worksurface that is unsupported by cabinetry at 16 inches o.c., unless otherwise indicated.
 - 1. Materials: Formed steel shapes.
 - a. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - b. Color: To be selected by Architect from manufacturer's full range.
 - 2. Load Capacity: 1000 lbs minimum per pair of brackets, tested at 16 inches o.c. spacing.
 - 3. Size: Provide nominal sizes below. Provide additional sizes as required for other countertop/workstation applications indicated on Drawings.
 - a. Provide 21 inches high by 28 inches deep for standard 30 inch deep countertops.
 - b. Provide 21 inches high by 21 inches deep for standard 25 inch deep countertops.
 - 4. Products:
 - a. A&M Hardware, Inc; Standard Brackets.
 - b. Best Brackets; ADA Workstation Support Standard Steel Bracket.
 - c. FastCap; SpeedBrace.
 - d. Lyman Associates; Counter Top Supports.
 - D. Drawer and Door Pulls: BHMA A156.9, B02011, back-mounted "U" shaped wire pull, steel with chrome finish, 4 inch centers.
 - E. Cabinet and Drawer Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish. Provide on all cabinet doors and drawers unless otherwise indicated.
 - F. Drawer Slides:
 - 1. Type: Full extension.
 - 2. Static Load Capacity: Heavy Duty grade.
 - a. For standard box drawers under 30 inches wide, provide BHMA Grade 1HD-100 with minimum load capacity of 100 lbf.
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- b. For file drawers and drawers 30 inches wide or larger, provide BHMA Grade 2HD-200 with minimum load capacity of 200 lbf.
- c. For pencil drawer slides, provide 3/4 extension with minimum load capacity of 45 lbf.
- 3. Mounting: Side mounted.
- 4. Stops: Integral type.
- 5. Features: Provide soft close type.
- 6. Manufacturers:
 - a. Accuride International, Inc.
 - b. Fullerer USA.
 - c. Grass America Inc.
 - d. Knappe & Vogt Manufacturing Company.
- G. Filing Cabinet Suspension System: Provide 14-gauge steel file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, are not acceptable.
- H. Hinges: Butt type, BHMA A156.9, Grade 1, 2-3/4 inch, 5-knuckle steel with nickel-plated finish. Provide with antifriction bearings and rounded hospital tips.
 - 1. Provide two hinges for doors less than 48 inches high, and three hinges for doors more than 48 inches high.
- I. Hooks: Surface-mounted; stainless steel, satin finish.
 - 1. Product:
 - a. Coat Hook Strip
 - b. 36" wide x 2" high
 - c. (6) Slip Resistant Hooks with rounded edges
 - d. Include mounting screws
 - e. Provide submittal for approval
- J. Keyboard Tray: Integral ball-bearing slides; adjustable tilt, palm rest, cable management, and mouse pad.
 - 1. Manufacturers:
 - a. Accuride International, Inc; CBERGO-Tray 200.
 - b. Doug Mockett; #KP7 / M2-90.
 - c. Fullerer; #FR 1602.
 - d. Knappe & Vogt; # KD-110.
 - e. WorkRite Ergonomics; Banana Board.
 - f. Substitutions: See Section 016000 - Product Requirements.

2.11 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
 - 1. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
 - 2. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
 - 3. Seal or prime paint concealed cut edges of wood and laminate casework.

- D. Hardware Application: Factory-machine casework members for hardware that is not surface applied.
- E. Apron Frames: Construction similar to other cabinets, with modifications.
 - 1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.
- F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel exposed edges.
- G. Solid Surfacing: Fabricate in one piece to greatest extent possible; join pieces with adhesive sealant and finish joints smooth in accordance with manufacturer's recommendations and instructions.
 - 1. Fabricate with butt-jointed / square edge at all solid surface corners. Mitered solid surface corners are not acceptable.
- H. Countertop Fabrication: Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall, or as indicated.
 - 2. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- I. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Height: 4 inches, unless otherwise indicated.
 - 2. Mechanically fasten back and end splashes to countertops with steel brackets at 16 inches on center.
- J. Wall-Mounted Counters (not mounted over cabinets): Provide ADA compliant knee space with brackets, skirts, or aprons, as indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver woodwork or casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point, and provide field modifications as required to not exceed maximum height dimensions.
 - 1. Construction tolerances shall not apply to casework maximum height dimensions; maximum indicated dimension shall be maintained at any point along the length of casework, regardless of floor levelness.
 - 2. Field modifications shall be made to the toe kick to account for leveling due to floor levelness.

- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
 - 1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
 - 2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- D. Verify adequacy of backing and support framing.
- E. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade(s) indicated and in accordance with manufacturer's instructions.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- G. Secure wall cabinets at top and bottom, at each end and no more than 16 inches on center. Secure directly into metal wall framing, or into FRT wood or metal channel blocking with No. 10 wafer head screws. Wall mounted hanger strips are not acceptable.
- H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- I. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.05 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 064100

**SECTION 071300
SHEET WATERPROOFING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- D. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- F. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at the Project site; at minimum one week prior to commencing work of this section.
 - 1. Review required surface/substrate conditions and preparations, field conditions for application and curing/drying time, special installation details and procedures, inspection, and protection and repair.

1.03 SUBMITTALS

- A. Product Data: Provide data for waterproofing membrane and for drainage panel.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- C. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified; approved and/or certified in writing by manufacturer for installation of specified products.

1.05 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer materials-only warranty for material failure or waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.
- C. Provide two year installer's warranty covering faulty workmanship/installation.
 - 1. Warranty shall include removal and reinstallation of drainage panels.

PART 2 PRODUCTS

2.01 SHEET WATERPROOFING MATERIALS

- A. Self-Adhered Modified Bituminous Sheet Membrane:
 - 1. Thickness: 60 mil, 0.060 inch, minimum.
 - 2. Tensile Strength:
 - a. Membrane: 250 psi, minimum, measured in accordance with ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
 - 3. Elongation at Break: 300 percent, minimum, measured in accordance with ASTM D412.
 - 4. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
 - 5. Low Temperature Flexibility: Unaffected when tested in accordance with ASTM D1970/D1970M at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
 - 6. Water Absorption: 0.2 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
 - 7. Hydrostatic Pressure Resistance: Membrane resists leakage for at least one hour from pressure equivalent to 200 feet head of water applied in accordance with test method ASTM D5385/D5385M.
 - 8. Puncture Resistance: 40 lb, minimum, measured in accordance with ASTM E154/E154M.
 - 9. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
 - 10. Available Products:
 - a. Carlisle Coatings & Waterproofing Inc; MiraDRI 860/861.
 - b. CETCO, a division of Minerals Technologies Inc; ENVIROSHEET.
 - c. GCP Applied Technologies; Bituthene 4000.
 - d. Henry Company; Blueskin WP 200.
 - e. MAPEI Corporation; Mapethene.
 - f. Mar-flex Waterproofing & Building Products; ArmorSheet 600.
 - g. Polyguard Products; Polyguard 650.
 - h. Tamko Building Products, Inc.; TW-60.
 - i. W. R. Meadows, Inc; MEL-ROL.
 - j. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

- A. General: Provide all accessories required by waterproofing manufacturer for a complete waterproof assembly for substrate and installation type indicated.
- B. Primer or Surface Conditioner: Liquid product recommended by waterproofing manufacturer for substrate preparation.
- C. Seaming Materials: As recommended by membrane manufacturer.
- D. Detail Strip: Self-adhering waterproofing strips, fabricated of same material and thickness as waterproofing membrane, in narrow widths for use at joints and details.
- E. Membrane Sealant: As recommended by membrane manufacturer.
- F. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.
- G. Drainage Panel: Drainage layer with geotextile filter fabric on earth side.

1. Composition: Dimpled molded plastic core; polypropylene or polyester filter fabric bonded to one side, and a polymeric film bonded to the other side. Compressive strength of 15,000 psi.
 2. Thickness: 0.40 inch, minimum.
 3. Products: One of the following or a comparable product by one of the waterproofing manufacturers listed above.
 - a. American Hydrotech, Inc.; Hydrodrain 400.
 - b. Carlisle Coatings & Waterproofing, Inc.; CCW MiraDrain 6200.
 - c. GCP Applied Technologies; Hydroduct 220.
 - d. W.R. Meadows, Inc; Mel-Drain 5035-B.
- H. Termination Bars: Aluminum; compatible with membrane and adhesives.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces from damage not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Fill nonmoving joints and cracks with a filler compatible with waterproofing materials.
- E. Seal moving cracks with sealant and nonrigid filler, using procedures recommended by sealant and waterproofing manufacturers.
- F. Prepare building expansion joints at locations as indicated on drawings.

3.03 INSTALLATION - MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane, and minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.
- D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
- G. Install building expansion joints at locations as indicated on drawings.
- H. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
- I. Seal membrane and flashings to adjoining surfaces.

1. Install termination bar along edges.
2. Install counterflashing over exposed edges.

3.04 INSTALLATION - DRAINAGE PANEL

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward; scribe and cut boards around projections, penetrations, and interruptions.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer's technical representative shall provide inspection services no less than 3 times during the course of installation: inspection of substrate conditions and preparations (preinstallation meeting), during membrane and detailing installation, and during drainage/protection board installation.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION 071300

**SECTION 072100
THERMAL INSULATION**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- C. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. CAN-ULC-S705.1 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification.
- F. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

- A. NFPA 285 Tested Assembly: Provide foam plastic insulation products located in exterior wall assemblies that have been tested in accordance with NFPA 285 which represent those exterior wall assemblies for this Project.
 - 1. Potential heat in Btu per square feet shall not exceed the potential heat of the foam plastic insulation contained in the wall assembly tested as determined by tests in accordance with NFPA 259.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect foam-plastic insulation from physical damage, including chipping, cracking, or soiling. Do not use boards that are damaged due to delivery or handling.
- B. Store insulation in a manner that protects from damage or deterioration, including moisture, soiling, or UV exposure.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.
- B. Coordinate with insulation manufacturer for UV exposure requirements and coordinate the schedule of construction to ensure insulation is concealed in a timely manner.

PART 2 PRODUCTS

2.01 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: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

2.02 BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
 - 3. Facing: Unfaced.
- B. 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.

2.03 MISCELLANEOUS GAP / CRACK FILLER

- A. General: Fill miscellaneous joints and cracks with mineral wool batt insulation (specified above) or with closed-cell polyurethane foam at Contractor's option.
- B. Closed Cell Polyurethane Foam:
 - 1. Provide insulation that conforms to CAN-ULC-S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material" or ASTM C1029, Type II, and performance requirements listed.
 - 2. Flame-spread index of 0 and maximum smoke development index of 5, when tested in accordance with ASTM E84.
 - 3. Products:
 - a. Dow; Enerfoam Professional Foam Sealant.
 - b. Dupont; Great Stuff Pro Gaps & Cracks.
 - c. Hilti; CF-AS Crack and Joint All Seasons.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

- A. Tape joints of rigid insulation in accordance with insulation manufacturers' instructions.
- B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- C. 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 wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
- B. Apply adhesive to back of boards per manufacturer's instructions, or, at Contractor's option install insulation boards to tacky dampproofing/mortar parge coat before it has cured.
- C. Install boards horizontally on foundation perimeter.
 - 1. Place boards to maximize adhesive/substrate contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate to manufacturer's required quantity and spacing.
- B. Install boards to fit snugly between wall ties.
- C. Install boards horizontally on walls.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and protrusions.
 - 3. Place impale fastener locking discs.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

**SECTION 072736
SPRAYED FOAM (SPF) AIR BARRIER**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
- C. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.
- G. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.
- H. CAN-ULC-S705.1 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material Specification.
- I. CAN-ULC-S705.2 - Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application.
- J. NFPA 259 - Standard Test Method for Potential Heat of Building Materials.
- K. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.03 SUBMITTALS

- A. Product Data: Provide product description, insulation properties, and preparation requirements.
 - 1. Provide current Evaluation Service Report upon request.
- B. Compatibility Data: Provide manufacturer's data indicating compatibility between submitted SPF and transition membrane products.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection as required by ABAA QAP.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP):
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

- a. Install shall also be certified by ABAA/BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the CAN-ULC-S705.2 Installation Standard. Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.
 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.
- B. NFPA 285 Tested Assembly: Provide foam plastic insulation products located in exterior wall assemblies that have been tested in accordance with NFPA 285 which represent those exterior wall assemblies for this Project.
1. Potential heat in Btu per square feet shall not exceed the potential heat of the foam plastic insulation contained in the wall assembly tested as determined by tests in accordance with NFPA 259.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

1.06 WARRANTY

- A. Material Warranty: Manufacturer's standard warranty against manufacturing defects, for a minimum period of 3 years.
- B. Installation Warranty: Air barrier subcontractor's installation warranty, effective from date of Substantial Completion for a minimum period of 2 years. Installation warranty shall include all components of the air barrier assembly, including loss of airtight seal, loss of watertight seal, loss of adhesion, loss of cohesion, or failure to cure properly.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Spray Polyurethane Foam (SPF) Air Barrier/Insulation: Medium-density, rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 1. Provide insulation that conforms to CAN-ULC-S705.1 or ASTM C1029, Type II, and performance requirements listed.
 2. Thermal Resistance: R-value of 6.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
 3. Density: Minimum 1.9 pounds per cubic foot.
 4. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
 5. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
 6. Air Permeance (Material): Not to exceed 0.004 cfm per square foot, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
 7. Ozone Depletion Potential (ODP): Zero.
 8. Closed Cell Content: At least 90 percent.
 9. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
 10. Products:
 - a. BASF Corporation; WALLTITE US.
 - b. Henry Company; Permax 2.0 HFO.

- c. Huntsman Building Solutions; ProSeal HFO Pro.
 - d. Johns Manville; JM Corbond IV Closed Cell Spray Polyurethane Foam.
 - e. NCFI Polyurethanes; InsulBloc HFO.
 - f. Substitutions: See Section 016000 - Product Requirements.
- B. Air Barrier Assembly Performance: Air barrier assembly, including primary air barrier and auxiliary materials, including joints and transitions to adjacent materials, shall have an air leakage rate not to exceed 0.04 cfm per square foot, at 1.57 psf pressure differential when tested per ASTM E2357. The air barrier assembly shall also serve as liquid water control layer, and shall be flashed to direct moisture to the exterior.

2.02 ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Membrane at Transitions in Substrate and Connections to Adjacent Elements: Nominal 40-mil thick, impermeable, self-adhering sheet membrane.
 - 1. Available Products:
 - a. Carlisle Coatings and Waterproofing; CCW-705.
 - b. Grace Construction Products; Perm-A-Barrier Flashing.
 - c. Henry Company; Blueskin SA.
 - d. Protective Coatings Technology, Inc; Poly-Wall Crack Guard.
 - e. Tremco, Inc.; ExoAir 110.
 - f. W. R. Meadows, Inc.; Air Shield.
- C. Membrane at Transitions between Spray Foam Air Barrier and Roofing and Other Adjacent Materials: Provide impermeable transition membrane that complies with both air barrier manufacturer's recommendations and adjacent material manufacturer's recommendations.
- D. Spray Foam Stop and Screed: L-shaped stop and screed designed as a spray foam termination accessory, fabricated of stable UV-resistant plastic and acceptable to spray foam manufacturer. Outer leg shall be sized to match spray foam thickness indicated. "Jam-Ex" by Exo-Tec Manufacturing, Inc., or equivalent product.
- E. Counterflashing for Masonry Through-Wall Flashing: Nominal 40-mil thick, impermeable, self-adhering membrane.
 - 1. Available Products:
 - a. Carlisle Coatings and Waterproofing; CCW-705 TWF.
 - b. Grace Construction Products; Perm-A-Barrier Flashing.
 - c. Henry Company; Blueskin TWF.
 - d. Protective Coatings Technology, Inc.; Poly-Wall Crack Guard.
 - e. Tremco, Inc.; ExoAir TWF.
 - f. W. R. Meadows, Inc.; Detail Strip.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete before insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.

- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Apply to the minimum cured thickness indicated on Drawings.
- D. Patch damaged areas.
- E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- F. Building Expansion Joints: Do not bridge joints with spray foam material. Provide a L-shaped stop/screed on each side of joint, pack joint with compressible insulation, and bridge the joint with flexible transition membrane to provide continuous air barrier assembly.
- G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Field inspections and tests will be performed by a third party ABAA testing agency.
- C. Inspection will include verification of insulation thickness and density.
- D. Coordination of ABAA Tests and Inspections:
 - 1. Arrange and pay for testing and inspection required by ABAA QAP.
 - a. Testing and inspection shall verify conformance with ABAA Quality Assurance Program, the CAN-ULC-S705.2 Installation Standard, manufacturer's written installation instructions, and other requirements of this section.
 - b. Unless indicated otherwise, provide ABAA Quality Assurance Program audits in accordance with current "Frequency & Cost of Audits" posted on ABAA website. Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed. In the case of deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at time of inspection.
 - 2. Notify ABAA in writing of schedule for air barrier work. 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.
- E. In addition to the ABAA site inspector, coordinate and provide access for air barrier manufacturer's technical representative to make field reviews during installation and provide technical reports to Contractor, Owner, and Architect.
- F. Patch air barrier work that was removed or damaged due to testing.
- G. If testing and inspection reveals any defects, promptly remove and replace defective work at no additional expense to the Owner.

3.05 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION 072736

**SECTION 074213
METAL WALL PANELS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 SUBMITTALS

- A. 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.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- C. Selection Samples: Submit manufacturer's color charts representing manufacturer's standard range of available colors.
- D. Verification Samples: Submit physical samples in manufacturer's standard size indicating panel profile and selected color, for each type of product required.
- E. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.
- F. 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.

1.03 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.04 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.

1.05 FIELD CONDITIONS

- A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

- B. Finish Warranty: Correct defective work within a twenty year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- C. Weathertightness Warranty: Correct defective work within a five 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 - Concealed Fasteners:
 - 1. ATAS International, Inc.
 - 2. Centria.
 - 3. Dimensional Metals, Inc.
 - 4. Englert, Inc.
 - 5. Fabral.
 - 6. Metal Roofing Systems, Inc.
 - 7. Morin Corporation.
 - 8. 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. 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.
 - 2. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
 - 3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
 - 4. 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.
 - 5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - 7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.
 - 8. Provide continuity of air barrier seal at building enclosure elements in accordance with requirements; see Section 072736 - Sprayed Foam (SPF) Air Barrier.
- B. Exterior Wall Panels:
 - 1. Basis-of-Design: Centria; Concept CS-660E profile.
 - 2. Profile: Vertical; flush profile with minimal seam between panels; no reveal.
 - 3. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
 - 4. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
 - 5. Panel Width: 12 inches.
 - 6. Panel Depth: 1-1/2 inches.
 - 7. Color: To be selected by Architect from manufacturer's standard range.

- C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- D. Expansion Joints: Same material, thickness and finish as exterior sheets; manufacturer's standard brake formed type, of profile to suit system.
- E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- F. Anchors: Galvanized 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.

2.04 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

2.05 ACCESSORIES

- A. CI Framing System: Refer to Division 5, Section 054003 - Continuous Insulation (CI) Framing System, Clipped.
- B. Secondary Rail (Subgirt/Furring): Provide manufacturer's recommended cladding support rail; hat-channel or z-girt profile as recommended; fabricated of ASTM A653/A653M G90/Z275 galvanized steel sheet; for installation to CI Framing System.
- C. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
- D. Concealed Sealants: Non-curing butyl sealant or tape sealant, refer to Section 079200 - Joint Sealants.
- E. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- F. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized.
 - 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
- G. Field Touch-up Paint: As recommended by panel manufacturer.
- H. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that air barrier system/insulation and CI framing system are properly installed.
- C. Verify air barrier, see Section 072736 - Sprayed Foam (SPF) Air Barrier, has been installed over wall panel substrate; coordinate with Division 5, Section 054003 - Continuous Insulation (CI) Framing System, Clipped.

3.02 PREPARATION

- A. Install subgirts/furring perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane, and spaced at intervals required by manufacturer to meet structural requirements.
- B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

- A. Install panels on walls and soffits in accordance with manufacturer's instructions.
- 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 2 inches, minimum.
- F. Provide expansion and control joints where length exceeds that recommended by manufacturer.
- G. Use concealed fasteners unless otherwise indicated by Architect.

3.04 TOLERANCES

- A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.
- B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 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.

3.06 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 074213

SECTION 074213.23
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- F. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- L. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- M. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives.
- N. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- P. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
 - 1. Require attendance by MCM installer, CI framing installer (if a different entity), and other relevant sub-contractors (such as aluminum storefront/curtain wall, air barrier, insulation).
 - 2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review procedures.
 - 3. Review in detail the schedule, personnel, and installation of adjacent materials and substrate.

4. Review project specific details including joint details (both panel-to-panel joints and panel to adjacent construction), penetrations, openings.
5. Review field testing, inspection, and other quality assurance requirements.
6. Review procedures for protection of work and other construction.

1.03 SUBMITTALS

- A. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 2. Storage and handling requirements and recommendations.
 3. Fabrication instructions and recommendations.
 4. Specimen warranty for finish, as specified herein.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 1. Physical characteristics of components shown on shop drawings.
 2. Storage and handling requirements and recommendations.
 3. Installation instructions and recommendations.
 4. Specimen warranty for wall system, as specified herein.
- C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, number of anchors, supports, reinforcement, trim, flashings, and accessories.
 1. Indicate panel numbering system.
 2. Differentiate between shop and field fabrication.
 3. Indicate substrates and adjacent work with which the wall system must be coordinated.
 4. Include large-scale details of anchorages and connecting elements.
 5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Selection Samples: Submit manufacturer's color charts representing manufacturer's standard range of available colors.
- E. Verification Samples: For each finish product specified, submit physical sample in manufacturer's standard size indicating selected colors.
- F. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
- G. Test Report: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly utilizing identical products and components to those submitted for installation on this project.
- H. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
- I. Installer's qualification statement.
- J. Testing agency's qualification statement.
- K. Maintenance Data: Care of finishes and warranty requirements.

1.04 QUALITY ASSURANCE

- A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
-

- B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Installer Qualifications: Company specializing in performing work of type specified in this section.
 - 1. Approved / certified in writing by wall panel system manufacturer.
- D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.

1.05 MOCK-UPS

- A. Integrated Exterior Mockups: Attend preinstallation conference for and provide metal composite material panels and associated components for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect finishes by applying heavy-duty removable plastic film during production.
 - 2. Package for protection against transportation damage.
 - 3. Provide markings to identify components consistently with drawings.
 - 4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.
- B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1. Store in well-ventilated space out of direct sunlight.
 - 2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
 - 3. Store at a slope to ensure positive drainage of accumulated water.
 - 4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
 - 5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.07 FIELD CONDITIONS

- A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of wall panels. Complete forms in Owner's name and register with warrantor.
- C. Finish Warranty: Provide 5-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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Composite Material (MCM) Sheet Manufacturers:
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1. ALUCOBOND by 3A Composites USA; Alucobond Plus.
2. Alcoa, Inc.; Reynobond FR.
3. Alfrex, LLC; Alfrex FR.
4. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core).
5. Fairview Architectural LLC; VitraBond G2 (Non-Combustible).

2.02 WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.
 1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
 2. Provide panel jointing and weatherseal using rainscreen "spline" type system.
 3. Anchor panels to supporting framing without exposed fasteners.
- B. NFPA 285 Fire Propagation Test: Exterior metal-faced composite material wall panel assemblies shall be tested and pass NFPA 285; assembly shall have been tested using identical products and components to those submitted for installation on this project.

2.03 PERFORMANCE REQUIREMENTS

- A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
- B. Fire Performance: Provide panels that have been tested in approved assemblies, in accordance with, and complying with acceptance criteria of NFPA 285.

2.04 PANELS

- A. Panels: 1 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
 1. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
 2. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
 3. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
 4. Fabricate panels under controlled shop conditions.
 5. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
 6. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
 - a. Make panel lines, breaks, curves, and angles sharp and true.
 - b. Keep plane surfaces free from warp or buckle.
 - c. Keep panel surfaces free of scratches or marks caused during fabrication.
 7. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

8. Provide means of concealed drainage for panel condensation and water that might accumulate in members of system; drill perforated weep holes on underside return of each panel, and provide insect baffle at each weep hole.

2.05 MATERIALS

- A. Metal Composite Material (MCM) Sheet: Fire-retardant composite panel fabricated of two sheets of aluminum sandwiching a mineral-filled core; no foamed insulation material content.
 1. Overall Sheet Thickness: 0.157 inch, minimum (4 mm).
 2. Face Sheet Thickness: 0.020 inches, minimum, equal thickness for both exterior and interior facings. Unequal facings are not acceptable.
 3. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
 4. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 5. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.
- B. Metal Framing Members: Coordinate with Section 054003 - Continuous Insulation (CI) Framing System, Clipped. Provide manufacturer's recommended sub-girts/furring channels, installation clips, base and sill angles and channels, as required for complete installation over continuous insulation framing system.
 1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
 2. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

2.06 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, with at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.
- B. Color/Texture: To be selected by Architect from manufacturer's standard range.

2.07 ACCESSORIES

- A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet.
 - B. CI Framing System: Refer to Division 5 Section 054003 - Continuous Insulation (CI) Framing System, Clipped.
 - C. Secondary Rail (Subgirt/Furring): Provide manufacturer's recommended cladding support rail; hat-channel or z-girt profile as recommended; fabricated of ASTM A653/A653M G90/Z275 galvanized steel sheet; for installation to CI Framing System.
 1. Layout for subgirt/furring shall be at manufacturer's required spacing for final support and installation of cladding attachment clips and metal panel system.
 - D. Cladding Support Clips: Manufacturer's galvanized steel clip system for installation of cladding to subgirts, angles, channels and other framing.
 1. Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 galvanized coating.
 - E. Anchors, Clips, and Accessories: Use one of the following:
 1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
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2. Steel complying with ASTM A36/A36M and hot-dip zinc coating to ASTM A153/A153M.
 3. Steel complying with ASTM A36/A36M and hot-dip galvanized to ASTM A123/A123M, with Coating Thickness Grade of 100.
- F. Fasteners:
1. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
 2. Bolts: Stainless steel.
 3. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.
- G. Joint Sealer: Provide color to match wall panels silicone sealant of type approved by MCM sheet manufacturer, and in compliance with ASTM C920.
- H. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices, and attachments.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine dimensions, tolerances, and interfaces with other work.
 1. Verify that air barrier system/insulation and CI framing system are properly installed.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect adjacent work areas and finish surfaces from damage during installation.

3.03 INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.
- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
- F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
- G. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

- H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
 - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
- I. Replace damaged products.
 - 1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
 - 2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

3.05 CLEANING

- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
- B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
- C. Remove temporary coverings and protection of adjacent work areas.
- D. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

- A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION 074213.23

**SECTION 075423
TPO MEMBRANE ROOFING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- E. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM G152 - Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.
- H. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
- I. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials.
- J. FM (AG) - FM Approval Guide.
- K. FM 4474 - American National Standard for Evaluation of Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- L. FM DS 1-28 - Wind Design.
- M. NFPA 276 - Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components.
- N. NRCA (RM) - The NRCA Roofing Manual.
- O. NRCA (WM) - The NRCA Waterproofing Manual.
- P. UL (FRD) - Fire Resistance Directory.
- Q. UL 1256 - Standard for Fire Test of Roof Deck Constructions.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at the Project site one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.03 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- B. Shop Drawings: Submit drawings that indicate joint or termination detail conditions and conditions of interface with other materials.
 - 1. Include details of tapered insulation and crickets.

2. Include edge conditions showing details of roofing assembly connection to wall air barrier material to maintain a continuous air barrier system.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 1. Submit in the form of manufacturer's assembly letter, indicating each component of the roofing assembly as specified, and that assembly meets performance requirements and manufacturer's warranty conditions.
- D. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Warranty Documentation:
 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of products specified, with UL-listed roof assemblies for roof systems indicated.
- B. Installer Qualifications: Company specializing in installation of roof systems indicated, and approved / certified by roofing manufacturer to install products specified.
- C. Insulation Manufacturer Qualifications: Approved by roof membrane manufacturer, and approved and labeled under third party quality program as required by applicable building code.
 1. Insulation Labeling: All foam insulation shall bear the label of testing/inspection agency, and shall include manufacturer identification, product identification, performance characteristics, and other information as necessary to verify code compliance for intended end use.

1.05 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.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.06 FIELD CONDITIONS

- A. Do not install roofing materials during unsuitable weather, or when unsuitable weather is expected. Proceed only when field conditions are in accordance with roofing manufacturer's installation and warranty requirements.
- B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- C. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
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- B. Special Warranty - Manufacturer: Manufacturer's warranty form, customized for project-specific conditions.
 - 1. Manufacturer's warranty shall be a "total system" or "edge-to-edge" warranty; no dollar limit ("NDL").
 - 2. Include all components of roofing system including, but not limited to, roofing membrane, roof insulation, adhesives and fasteners, flashings, edge metals and copings, roof insulation and cover board.
 - 3. Provide wind coverage to 72 mph. Wind rider shall apply to all components of roofing system.
 - 4. Manufacturer's Total System Warranty Period: 20 years, from date of Substantial Completion.
- C. Special Warranty - Installer: Installer shall sign and submit per warranty form attached at end of this section.
 - 1. Installer's warranty shall cover all components of roofing system, matching manufacturer's warranty above.
 - 2. Installer's Warranty Period: 2 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle Roofing Systems, Inc.
 - 2. Elevate.
 - 3. GAF.
 - 4. Johns Manville.

2.02 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over cover board, insulation, and metal roof decking.
- B. Roofing Assembly Performance Requirements:
 - 1. General: Installed roofing assembly and all associated components shall remain secure and watertight and shall withstand weather exposure, wind uplift pressures specified, and thermal movements. Roofing manufacturer shall certify that all roofing assembly components are compatible with each other and with adjacent materials for applications indicated.
 - 2. Roof Covering External Fire Resistance Classification: UL (FRD) Class A.
 - 3. Assembly Resistance to Internal Fire: Manufacturer's assembly shall be tested to and satisfactorily pass NFPA 276 or UL 1256.
 - 4. Wind / Uplift Design: Membrane roofing system shall be identical to system that has been successfully tested by a qualified testing and inspecting agency to resist uplift pressures calculated according to ASCE 7 as established by applicable building code and loading indicated.
 - a. Corner, Perimeter, Field-of-Roof Uplift Pressures: Per applicable building code and values indicated on Structural Drawings.
 - b. Static Uplift: In addition to uplift requirements above, system shall be tested for static uplift per FM 4474, UL 580, or UL 1897.
 - 5. Assembly Thermal Resistance (R-Value): Provide roof assembly with a minimum assembly R-value of R-30 in accordance with applicable IECC requirement for commercial roofing.

6. Accelerated Weathering: 2,000 hours minimum exposure, when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
7. Ponding Water: Ponding water shall not remain on the roof 24 hours after a rainfall event.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrim.
 - a. Thickness: 60 mil, 0.060 inch, minimum.
 2. Sheet Width: Factory fabricated into widest possible sheets.
 3. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

2.04 COVER BOARDS

- A. Cover Board: High compressive strength polyisocyanurate (ISO) board insulation complying with ASTM C1289, and the following characteristics:
 1. Classifications:
 - a. Type II - Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 4 - Faced with coated or uncoated glass fiber mat facers on both major surfaces of the core foam. This product is used at a maximum thickness of 1/2 inch (12.7 mm).
 - (a) Compressive Strength: Grade 1; 80 psi, minimum/109 psi, maximum.
 2. Board Size: 48 by 48 inches, maximum.
 3. Board Thickness: 1/2 inch.
 4. Thermal Resistance: R-value of 2.5, minimum, at 1/2 inch thick and 75 degrees F mean temperature.
 5. Products:
 - a. Carlisle; SecurShield HD.
 - b. Elevate; Isogard HD Cover Board.
 - c. GAF; EnergyGuard HD.
 - d. Johns Manville; ProtectoR.

2.05 INSULATION

- A. Surface Burning Characteristics: Foam plastic insulation shall have a maximum flame spread index of 75, and maximum smoke developed index of 450, when tested in accordance with ASTM E84 at maximum thickness intended for use.
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 1. Classifications:
 - a. Type II:
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of core foam.
 - 2) Compressive Strength: Grade 2 - 20 psi, minimum.
 2. Tapered Board: Slope as indicated, but no lower than 1/4 inch per foot; minimum thickness 1/2 inch; fabricate of fewest layers possible.

3. Preformed Shapes: Provide saddles crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, but no less than 1/4 inch per 12 inches, and no less than 1/8 inch per 12 inches in valleys.

2.06 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Sheathing Joint Tape: Paper type, self adhering.
- C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
 1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Insulation Adhesive: As recommended by insulation manufacturer.
- F. Sealants: As recommended by membrane manufacturer.
- G. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 1. Composition: Roofing membrane manufacturer's standard.

PART 3 EXECUTION

3.01 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 other accessories are in place.

3.02 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.03 INSTALLATION - INSULATION, UNDER MEMBRANE

- A. Attachment of Insulation:
 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.

- a. At locations where metal roof deck will be exposed from below in the finished work, carefully coordinate fastener attachment such that fasteners do not penetrate the bottom flanges of the metal deck. Remove fasteners that penetrate the bottom flanges and replace with properly located fasteners, and restore metal deck to Owner's satisfaction.
 2. Embed subsequent layer(s) of insulation into either ribbons or full bed of adhesive as required to comply with performance or warranty requirements, and in accordance with roofing and insulation manufacturers' instructions.
 3. Install a minimum of two layers of insulation, with a minimum total thickness of 5 inches, to achieve a cumulative Long Term Thermal Resistance (LTTR) value of 28.5 per ASTM C 1289, followed by a cover board.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
 - C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
 - D. On metal deck, place boards with insulation board edges bearing on deck flutes.
 - E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
 - F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
 - G. Do not install more insulation than can be covered with membrane in same day.
 - H. Cover Boards: Secure cover boards in accordance with roofing manufacturer's instructions with manufacturer's insulation adhesive. Install cover boards with joints staggered minimum 6 inches from joints of preceding insulation layer.
 - I. Coordinate installation of air barrier transition membrane/flexible flashing to air seal material of wall construction, prior to installation of roof membrane; lap and seal to provide continuity of the air barrier plane.

3.04 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate per manufacturer's instruction. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by heat welding, minimum 3 inches unless otherwise required by manufacturer. Seal permanently waterproof.
- E. At intersections with vertical surfaces:
 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Install roofing expansion joints where indicated. Make joints watertight.
- H. Coordinate installation of roof drains and sumps and related flashings.
- I. Install walkway pads in layout indicated. If not indicated, provide from roof access hatch/door to each major piece of rooftop equipment and fully around perimeter of equipment. Space pad joints to permit drainage.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide on-site inspection by roofing manufacturer's technical representative at least three times (deck/substrate examination, in-progress, and warranty inspection) during installation of this work.
- C. Repair or replace roofing components where inspection determines they are defective.
 - 1. Repair or replace roofing system where ponding occurs in excess of specified requirement.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.
- D. Provide a final cleaning of the roof membrane immediately prior to Substantial Completion to remove dirt, clay and other soiling.

3.07 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 075423

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
- F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used including technical material properties.
 - 1. Include installation instructions and manufacturer's recommendations for installation and maintenance.
 - 2. Include ANSI/SPRI/FM 4435/ES-1 wind pull-off performance data for systems that will be used in edge metal conditions.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Selection Samples: Provide manufacturer's color charts for each product and material requiring color selection.
- D. Verification Samples: Submit physical samples, manufacturer's standard size, for each selected color.

1.03 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work, with experience in projects of size and scope similar to this Project.

1.04 MOCK-UP

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Integrated Exterior Mockup: Attend preinstallation conference and provide metal flashing/trim work for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge (0.028-inch) thick base metal, shop pre-coated with PVDF coating.
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: To be selected by Architect from Manufacturer's full range.
- B. Pre-Finished Aluminum: ASTM B209/B209M; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with PVDF coating.
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.
 - 2. Color: To be selected by Architect from Manufacturer's full range.
- C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 24 gauge (0.025-inch) thick; smooth No. 2D finish.
- D. Copper: ASTM B370, cold rolled 16 oz/sq ft, 24 gauge, 0.0216 inch thick; natural finish.

2.02 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.
- F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
 - 1. Hem exterior corners of flashings and drip edges, in a manner that eliminates sharp, exposed cut metal edges, at locations below 6'-0" above grade (locations within reach range of building occupants).
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.03 GUTTERS AND DOWNSPOUTS

- A. General: Provide minimum 0.040-inch aluminum extrusions for gutters and minimum 0.032-inch aluminum for downspouts. Finish all parts of gutter/downspout system a single color to match, including brackets, elbows and bends, and exposed fastener heads.
- B. Gutters: SMACNA Ogee profile (Style K); unless otherwise indicated.
- C. Downspouts: Rectangular profile; unless otherwise indicated.

- D. Gutter and Downspout Sizing: Unless otherwise indicated, provide 4-inch deep by 5-inch wide downspouts, with gutter depth to accept 4-inch deep downspout.
- E. Conductor Heads: Fabricate in accordance with SMACNA (ASMM) standards, Figure 1-25F box-type conductor head, or standard design of fabricator where approved by Architect. Conductor heads shall be fabricated of minimum 0.032-inch aluminum. Finish to match gutter and downspout finish.
- F. Scuppers: Fabricate scuppers in accordance with SMACNA (ASMM) standards; scupper shall outlet directly into conductor head per Figure 1-27A. Fabricate of minimum 16 oz copper or 26 gauge (0.01875 inch) stainless steel where scupper penetrates masonry. Provide manufacturer's recommended separation barrier between dissimilar metals of scupper and conductor head fabrications.
- G. Accessories: Profiled to suit gutters and downspouts. Provide additional elbows, bends, extended bracket depths, and other accessories as required for downspouts to avoid conflict with cladding profiles, masonry or precast extrusions, and other surface ornamentation on wall.
 - 1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2. Gutter Supports: Straps and spacer bars (SMACNA figure 1-17), spaced no more than 24 inches on center.
 - 3. Downspout Supports: Brackets; spaced no more than 60 inches on center.
 - 4. Downspout Strainers: Provide ball-type mesh strainer at each downspout; pre-fabricated, non-corrosive construction compatible with gutter/downspout material.
- H. Splash Blocks: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment. Lightweight "patio" blocks are not acceptable.
 - 1. Provide a splash block at all conditions where downspout is not indicated to connect to downspout boot, and at conditions where downspout empties onto lower roof.
- I. Downspout Boots: Cast iron, inlet sized to match downspout; outlet sized for underground drainage piping. Coordinate with Plumbing Drawings and Division 22.
- J. Seal metal joints.

2.04 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer Type: Zinc chromate.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
- F. Reglets and Counterflashings (Masonry): Embedded type, copper. Coordinate with Division 4 Section "Unit Masonry."
- G. Reglets and Counterflashings (Non-Masonry): Surface mounted two-piece reglet and counterflashing, or one-piece counterflashing, fabricated of pre-finished aluminum or galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets and one-piece counterflashings true to lines and levels, and seal tops with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Comply with SMACNA installation instructions and drawing details.
- B. For reglets installed into masonry veneer, furnish reglets to mason for installation as Division 4 Unit Masonry work progresses.
- C. Insert flashings into reglets to form tight fit; secure in place with wedges; seal flashings into reglets with sealant.
- D. Secure flashings in place using concealed fasteners.
- E. Apply plastic cement compound between metal flashings and felt flashings.
- F. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. Seal metal joints watertight.
- H. Secure gutters and downspouts in place with concealed fasteners.
- I. Slope gutters 1/4 inch per 10 feet, minimum.
- J. Connect downspouts to downspout boots, and grout connection watertight.
- K. At low roof conditions, and where not indicated to connect to downspout boots, provide a bottom elbow and set splash blocks under downspouts.

END OF SECTION 076200

**SECTION 077100
ROOF SPECIALTIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. NRCA (RM) - The NRCA Roofing Manual.

1.02 SUBMITTALS

- A. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
 - 1. Include test data/confirmation that copings and edge metals conform to ANSI/SPRI/FM 4435/ES-1 performance requirements.
- B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- C. Samples for Selection: Provide manufacturer's color charts for each product and material requiring color selection.
- D. Samples for Verification: Submit physical samples, manufacturer's standard size, for each selected color.

1.03 MOCK-UP

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Integrated Exterior Mockup: Attend preinstallation conference and provide roof specialty work for integrated exterior mockup as indicated on Drawings and as specified in Division 1 Section "Quality Requirements."

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Metals and Copings: Provide private-labeled products by one of the roofing manufacturers listed in Division 7 roofing section(s) as required to meet requirements and comply with terms of manufacturer's total system warranty.

2.02 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Fascia, and edge securement for roof membrane.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
- B. Gravel Stop: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-2 to positive and negative design wind pressure as defined by applicable local building code.
 3. Wall Width: As indicated on drawings.
 4. Outside Face Height: 6 inches.
 5. Material: Formed aluminum sheet, 0.040 inch thick, minimum, for wall thickness up to 15 inches. Provide minimum 0.063 inch thick where total wall thickness is over 15 inches..
 6. Finish: AAMA 2605, 70 percent polyvinylidene fluoride (PVDF).
 7. Color: To be selected by Architect from Manufacturer's full range.
 8. Products:
 - a. Carlisle; SecurEdge 200 Gravel Stop.
 - b. Elevate; Elevate Gravel Stop.
 - c. GAF; EverGuard Gravel Stop.
 - d. Johns Manville; Johns Manville Gravel Stop.
- C. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - a. Provide cantilever design sized for installation over masonry veneer without attachment to veneer.
 - b. Size copings to allow for cavity ventilation; do not block top of cavity with continuous nailers, and do not seal between coping and front veneer.
 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 3. Wall Width: As indicated on drawings.
 4. Outside Face Height: 6 inches.
 5. Inside Face Height: 4 inches.
 6. Material: Formed aluminum sheet, 0.050 inch thick, minimum, for wall thickness up to 15 inches. Provide minimum 0.063 inch thick where total wall thickness is over 15 inches..
 7. Finish: AAMA 2605, 70 percent polyvinylidene fluoride (PVDF).
 8. Color: To be selected by Architect from Manufacturer's full range.
 9. Products:
 - a. Carlisle; SecurEdge 200 Gold Cantilever Coping.
 - b. Elevate; Elevate Gold Cantilever Coping.
 - c. GAF; EverGuard Gold Cantilever Coping.
 - d. Johns Manville; Perma-Tite Gold Cantilever Coping.
- D. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- E. Multiple Penetration/Pipe Housing: Where multiple penetrations are required in close proximity, provide pipe chase housing fabricated of structural aluminum or galvanized steel curb, pre-finished aluminum chase housing with removable top cover, and individual gasketed pipe seals which exit the side walls of the housing. Size housing and provide number and size of pipe seals as required for each application.
1. Manufacturers:
 - a. Alta Products, LLC; Sigrist Pipe Chase Housing.

- b. Roof Penetration Housings, LLC; the Vault.

2.03 ELASTIC ROOF EXPANSION JOINTS

- A. Elastic Expansion Joints (Bellows-Type): Pre-fabricated joint assembly, consisting of a elastomeric flashing forming the primary joint membrane in a “bellows” shape, with 16 oz. copper flanges on each side; custom size and profile to suit project conditions indicated. Provide with manufacturer’s standard polymeric moisture barrier and insulation on underside of expansion joint as indicated. Provide complete assembly with splicing and accessory materials as required.
 - 1. Elastic-type expansion joint shall be approved by roofing manufacturer for compliance with roofing products and to maintain conditions of manufacturer’s warranty.
 - 2. Curb Flange Type: Metal L-shaped flange on each side of bellows, formed to curb size indicated.
 - 3. Wall-to-Curb Type: Metal flanged edges; 4-inch flat flange at vertical wall condition and L-shaped flange at curb side of bellows, formed to curb size indicated.
- B. Roof-to-Roof Elastic Expansion Joint: Roofing manufacturer's standard low-profile joint support compatible with roofing system indicated. Support fabricated of extruded EPDM, sized for joint width indicated. Ensure roofing membrane is securely bonded to both sides of joint and not bonded to expansion joint support to allow for movement.

2.04 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.

2.05 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
 - 1. Provide stainless steel fasteners for all exterior construction and for fastening aluminum and stainless steel fabrications.
- C. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Install components weathertight; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- C. Seal joints within components when required by component manufacturer.
- D. Anchor components securely.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- E. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- F. Coping Installation: Install coping cleats and chair with concealed fasteners. Anchor as required to meet ANSI/SPRI performance requirements and manufacturer's instructions, but at spacing of no greater than 36 inches on center.
- G. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION 077100

**SECTION 077200
ROOF ACCESSORIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders.
- B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices.
- C. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

- A. 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.
- B. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

1.03 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.

PART 2 PRODUCTS

2.01 ROOF CURBS

- A. General: Coordinate with Division 22, 23, and 26 for roof curbs and equipment supports specified with specific pieces of equipment.
 - B. Roof Curbs Manufacturers:
 - 1. AES Industries Inc.
 - 2. Curbs Plus, Inc.
 - 3. The Pate Company.
 - 4. LMCurbs.
 - 5. Roof Products & Systems (RPS).
 - 6. Thybar Corporation.
 - 7. Substitutions: See Section 016000 - Product Requirements.
 - C. 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. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
 - 2. Sheet Metal Material: Galvanized (zinc-coated) or galvalume (aluminum-zinc alloy) steel sheet; minimum 18 gauge (0.052-inch) thick; mill finish.
 - 3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
-

- a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
 - b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
 - c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
 - d. Lap lower curb flange ovetop of down sloping metal roof panel and seal connection.
4. Provide layouts and configurations indicated on drawings.
- D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
1. Provide preservative treated wood nailers along top of rails.

2.02 ROOF HATCHES AND VENTS

- A. Roof Hatch Manufacturers:
1. Bilco Company; Model NB-50TB.
 2. Milcor, Inc; Thermal Pro TP-1.
 3. Nystrom, Inc; ThermalMAX RHTA.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Roof Hatches: 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.
 - a. Coordinate with roof insulation height, including tapered insulation design as indicated, to provide a minimum 8 inch curb height above the highest adjacent point of roof membrane.
 2. Thermally Broken Hatches: Provide manufacturer's standard insulation and thermally-broken frame and cover.
 3. For Ladder Access: Single leaf; 30 by 36 inches.
 4. Operation and Hardware: Provide with manufacturer's standard gas springs with assisted lift and automatic hold open arm. Provide interior and exterior turn handles and interior padlock hasp (padlock NIC).
- 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 thick.
 2. Insulation: Manufacturer's standard; 3 inch rigid polyisocyanurate, located on outside face of curb.
- D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
 2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
 3. Insulation: Manufacturer's standard 3 inch rigid glass fiber.
 4. Gasket: Neoprene, continuous around cover perimeter.
- E. Safety Railing System: Roof hatch manufacturer's standard accessory safety rail system mounted directly to curb. Do not install safety railing to roof assembly.
1. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.

2. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
3. Posts and Rails: Manufacturer's standard galvanized steel, aluminum pipe, or fiberglass pipe; pre-finished in safety yellow color.
4. Fasteners: Stainless steel, Type 316.
5. Products:
 - a. BILCO Company; Bil-Guard 2.0.
 - b. Milcor, Inc.; SAF-T-RAIL.
 - c. Nystrom, Inc.; Roof Hatch Safety Railing SRC.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.03 HEAT AND SMOKE VENTS

- A. Smoke and Heat Vent Manufacturers:
 1. BILCO Company; Type ACDSV - Automatic Smoke Vent.
 2. Milcor, Inc; Model U-LP.
 3. Nystrom, Inc; Double Door AcousticMAX; Model SVY.
- B. Heat and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware. Heat and smoke vents shall be UL 793 listed.
 1. Mounting Substrate: Provide frames and curbs suitable for mounting on flat roof deck sheathing with insulation.
 - a. Coordinate with roof insulation height, including tapered insulation design as indicated, to provide a minimum 8 inch curb height above the highest adjacent point of roof membrane.
 2. Sound Rated Hatches: Two sets of double leaf doors with air space between upper and lower doors; upper doors to open upward, lower doors to open downward; minimum Sound Transmission Coefficient (STC) of 48.
 3. Thermally Broken Hatches: Provide manufacturer's standard insulation and thermally-broken frame and cover.
 4. Size: 48 inches by 72 inches nominal.
 5. Operation and Hardware: Provide with manufacturer's standard gas springs with assisted lift and automatic hold open arm. Provide interior and exterior turn handles and interior padlock hasp (padlock NIC).
 6. Vent Operation: Provide each of the following operation features.
 - a. Smoke Alarm Connection: Provide 24 VDC electric solenoid release device and coordinate smoke detector interconnections so that vents will automatically operate upon activation of smoke alarm system.
 - b. Electro-Thermal Release Mechanism: Automatic opening on melting of replaceable UL (DIR) listed fusible link at 165 degree F.
 - c. Exterior Manual Operation: External manual release cable.
 - d. Interior Manual Operation: Provide with manual interior winch to allow for operation from floor level and with manufacturer's rigging kit accessory; coordinate aircraft cable of length required to reach from vent to winch, along with extra length to allow for opening. Verify winch mounting height with Owner to prevent child access.

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.
- B. Roof Curbs and Equipment Supports: Install in lengths and in a manner such that curbs and equipment supports span multiple structural framing members, with adequate blocking and supports to distribute the equipment loads over metal decking and structural members without crushing.

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.

END OF SECTION 077200

**SECTION 078400
FIRESTOPPING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- C. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- E. ITS (DIR) - Directory of Listed Products.
- F. SCAQMD 1113 - Architectural Coatings.
- G. FM (AG) - FM Approval Guide.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- I. UL (FRD) - Fire Resistance Directory.

1.02 SUBMITTALS

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Installer's qualification statement.

1.03 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.
- B. Labeling: Provide permanent labels adjacent to each firestopping assembly. Labels shall be durable metal or plastic and fastened mechanically or with a self-adhering backing. Labels shall include the tested assembly/system number, fire rating of the adjacent building element/ firestopping, the firestopping installer and certification, date of installation, and specific instructions to "Do Not Disturb" and "Alert Building Personnel of Damage."
 - 1. Coordinate with Division 09 "Painting" for stenciled painted labeling of fire-rated walls and partitions.
- C. Installer Qualifications: Company specializing in performing the work of this section and trained/certified by firestopping manufacturer.

1.04 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products.
 - 2. A/D Fire Protection Systems Inc.
 - 3. Hilti, Inc.
 - 4. RectorSeal, a CSW Industrials Company.
 - 5. Specified Technologies Inc.
 - 6. Tremco Commercial Sealants & Waterproofing.
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Low-Emitting Materials:
 - 1. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
 - 2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

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.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated, but not less than 1 hour.
- 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.
- 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.
- 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. Air Leakage (Smoke Barriers): Provide systems that have been tested to show L Rating of no more than 5.0 cfm/sq. ft., both at ambient and elevated 400 deg F temperatures.

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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

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 backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.
 - 1. Coordinate with Division 09 Painting contractor to ensure that all fire-rated walls and partitions are properly labeled.

3.04 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

**SECTION 078426
THERMAL BARRIERS FOR PLASTICS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
- D. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- E. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- F. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.
- G. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- I. AWCI Technical Manual 12-B - Standard Practice for the Testing and Inspection of Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.
- J. ITS (DIR) - Directory of Listed Products.
- K. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers.
- L. NFPA 276 - Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components.
- M. FM (AG) - FM Approval Guide.
- N. FM 4880 - Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials.
- O. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- P. UL 1715 - Standard for Safety Fire Test of Interior Finish Material.
- Q. UL (FRD) - Fire Resistance Directory.
- R. UL 263 - Standard for Fire Tests of Building Construction and Materials.
- S. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting at the Project site one week before starting work of this section. Include other relevant installers including installers of any foam plastic materials over which thermal barriers are to be installed.

1.03 SUBMITTALS

- A. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- B. Product Test Reports: Provide test data indicating compliance with both Temperature Transmission Test and Integrity Fire Test.
- C. Evaluation/Compatibility Reports: Provide data indicating tested compatibility with submitted foam plastic material, for each assembly required.

- D. Installer's qualification statement.
- E. Inspection Reports: Provide inspection reports certified by thermal barrier manufacturer's technical representative, indicating that thermal barrier has been installed in accordance with manufacturer's requirements.

1.04 QUALITY ASSURANCE

- A. Fire Testing: Provide assemblies that provide 15-minute thermal barrier protection when tested in accordance with both the Temperature Transmission Fire Test and the Integrity Fire Test required by NFPA 275.
 - 1. Temperature Transmission Test: The thermal barrier product shall be tested for standard fire exposure in accordance with ASTM E119 or ANSI/UL 263.
 - 2. Integrity Fire Test: The thermal barrier assembly, including the specific thermal barrier and foam plastic products submitted for this project, shall be tested as an assembly in accordance with NFPA 276, FM 4880, ANSI/UL 1040, or ANSI/UL 1715.
 - 3. Evidence of passing both test requirements shall be required.
 - a. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - b. 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.
 - c. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Surface-Burning Characteristics: Thermal barrier product shall be tested in accordance with ASTM E84 and shall be rated for plenum exposure with maximum flame-spread index of 25 and maximum smoke-developed index of 50.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained, certified, or licensed in writing by manufacturer.
- D. Manufacturer's Inspection: Manufacturer's technical representative shall inspect foam plastic substrates prior to installation and in-progress work to ensure compliance with manufacturer's requirements, and shall provide inspection reports after each visit.
 - 1. Thermal barrier installer shall coordinate with manufacturer to provide anticipated installation dates.

1.05 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermal Barrier Manufacturers and Products:
 - 1. Cementitious SFRM Thermal Barrier for Cellular Foam:
 - a. Grace, W.R. & Co.; Monokote Z-3306 Series.
 - b. Southwest Fireproofing Products, Inc.; 7TB Thermal Barrier.
 - 2. Fire-Resistive, Water-Based, Intumescent Mastic Coating for Cellular Foam:
 - a. Thermal Product Research (TPR²); Fireshell.
 - b. Flame Seal Products, Inc.; Flame Seal TB.

- c. International Fireproof Technology, Inc.; DC315.
- 3. Cellulose SFRM Thermal Barrier for Cellular Foam:
 - a. International Cellulose Corp.; Ure-K.

2.02 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealants, and other accessory materials as required by manufacturer, that are compatible with the other materials in the thermal barrier assembly and that maintain the thermal barrier rating of the assembly.
- B. Mold and Mildew Resistance: Provide thermal barrier and accessory materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

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 backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed thermal barriers until special inspections are complete.
- C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Special Inspections: Inspection agency employed and paid by Owner, will examine all spray-applied fireproofing, including thermal barriers, in accordance with the IBC edition applicable to this Project.
 - 1. Testing Services: All fireproofing/thermal barriers shall be tested according to ASTM E605/E605M and ASTM E736/E736M. Mastics shall be tested according to AWCI Technical Manual 12-B.
- B. Repair or replace spray-applied fireproofing and thermal barriers at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean adjacent surfaces of thermal barrier overspray; clean all adjacent surfaces after application.

3.06 PROTECTION & REPAIR

- A. Protect adjacent surfaces from damage by material installation.
- B. If installed thermal barrier must be cut due to subsequent penetrations or other work, provide additional patching work as required to restore thermal barrier to a continuous, complete assembly at the time of Substantial Completion.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- C. Repair damage to thermal barriers caused by construction activities; verify that repaired work maintains a continuous, complete thermal barrier assembly.

END OF SECTION 078426

**SECTION 079200
JOINT SEALANTS**

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 092900 - Gypsum Board: Sealing acoustical and sound-rated walls and ceilings.

1.02 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- B. ASTM C834 - Standard Specification for Latex Sealants.
- C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- H. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- J. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- K. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- L. SCAQMD 1113 - Architectural Coatings.

1.03 SUBMITTALS

- A. 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.
- B. 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.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- F. 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.

G. Executed warranty.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section, and is approved and/or certified by manufacturer.
- B. 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. Allow sufficient time for testing to avoid delaying the work.
 4. Deliver sufficient samples to manufacturer for testing.
 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- C. 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. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Test date.
 - b. Copy of test method documents.
 - c. Age of sealant upon date of testing.
 - d. Test results, modeled after the sample form in the test method document.
 - e. Indicate use of photographic record of test.
- D. 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. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 6. 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.
- E. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
 3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Wall and ceiling joints.
 - c. Joints between plumbing fixtures and floor or wall construction.
 - d. 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. See Section 092900 for additional information.
 - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
 - e. Other joints indicated below.
 - 3. Do not seal the following types of joints:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant (ES-1), unless otherwise indicated.
 - 1. Type ES-5 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
 - 2. Type ES-1 or ES-2 - Joints between walls and frames of doors, windows, and louvers.
 - 3. Type SRS-1 - Bedding joints.
- C. Interior Joints: Use non-sag polyurethane sealant (ES-4), unless otherwise indicated.

1. Type ES-3 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 2. Type ES-5 - Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.
 3. Type AS-1 - Joints at sound-rated or acoustic assemblies, and at full-height panel wall and partition assemblies indicated to have sound attenuation batts.
 4. Type LS-1 - Joints around perimeters of interior doors, windows, elevator entrances, and similar framed openings.
- D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; 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.

2.02 JOINT SEALANTS - GENERAL

- A. Low-Emitting Materials:
1. Paints and Coatings: Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
 2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet the chemical content requirements of SCAQMD 1168.

2.03 NONSAG JOINT SEALANTS

- A. Type ES-1 - Low-Modulus 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. Nonstaining to Porous Stone: Nonstaining 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. Color: To be selected by Architect from manufacturer's full range.
 5. Products:
 - a. Master Builders Solutions; MasterSeal NP 100.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS 2000 SilPruf.
 - c. Pecora Corporation; Pecora 890 NST (Non-Staining Technology) or 890 FST (Field Tint).
 - d. Polymeric Systems, Inc.; PSI-641.
 - e. Tremco Commercial Sealants & Waterproofing; Spectrem 3 or Spectrem 4-TS (Field Tint).
 - f. Substitutions: See Section 016000 - Product Requirements.
- B. Type ES-2 - Medium-Modulus 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. Color: To be selected by Architect from manufacturer's full range.
 5. Manufacturers:
 - a. Dow Chemical Company; DOWSIL 795 Silicone Building Sealant.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- b. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant.
 - c. Pecora Corporation; Pecora 895 NST (Non-Staining Technology).
 - d. Tremco Commercial Sealants & Waterproofing; Spectrem 2.
 - e. Substitutions: See Section 016000 - Product Requirements.
- C. Type ES-3 - 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. Neutral- or acid-curing per manufacturer standard.
- 1. Color: White.
 - 2. Products:
 - a. Dow; DOWSIL 786 Mildew Resistant.
 - b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology).
 - c. Tremco Commercial Sealants & Waterproofing; Tremsil 600 or Tremsil 200.
 - d. Substitutions: See Section 016000 - Product Requirements.
- D. Type ES-4 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
- 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's full range.
 - 3. Products:
 - a. ITW Polymers Sealants; Permthane SM 7200.
 - b. Master Builders Solutions by BASF; MasterSeal NP2.
 - c. Pecora Corporation; DynaTrol II.
 - d. Sika Corporation; Sikaflex-2c NS.
 - e. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC or Vulkem 227.
 - f. Substitutions: See Section 016000 - Product Requirements.
- E. Type LS-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
- 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Grade: ASTM C834; Grade NF.
 - 3. Products:
 - a. Bostik, Inc; Chem-Calk 600.
 - b. ITW Polymers Sealants; SM 8200.
 - c. Master Builders Solutions; MasterSeal NP 520.
 - d. Pecora Corporation; AC-20 +Silicone.
 - e. Tremco Commercial Sealants & Waterproofing; Tremflex 834.
 - f. Substitutions: See Section 016000 - Product Requirements.
- F. Type AS-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging acoustical sealant.
- 1. Color: Standard colors matching finished surfaces, Type OP (opaque).
 - 2. Grade: ASTM C834; Grade NF.
 - 3. Manufacturers:
 - a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
 - b. Franklin International, Inc; Titebond GREENchoice Acoustical Smoke & Sound Sealant.
 - c. Hilti, Inc; CP 506 Smoke and Acoustical Sealant.

- d. Master Builders Solutions; MasterSeal NP 520.
 - e. Momentive Performance Materials, Inc/GE Silicones; RCS20 Acoustical.
 - f. Pecora Corporation; AC-20 FTR or AIS-919.
 - g. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant.
 - h. Tremco Commercial Sealants & Waterproofing; Tremstop Smoke and Sound.
 - i. Substitutions: See Section 016000 - Product Requirements.
- G. Type SRS-1 - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
- 1. Products:
 - a. Bostik, Inc; Chem-Calk 300.
 - b. Pecora Corporation; Pecora BC-158 Butyl Rubber Sealant.
 - c. Tremco Inc.; Tremco Butyl Sealant.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.04 SELF-LEVELING JOINT SEALANTS

- A. Type ES-5 - Self-Leveling Polyurethane Sealant for Traffic: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure.
- 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Products:
 - a. Bostik, Inc.; Chem-Calk 550.
 - b. ITW Polymers Sealants; Permthane SM 7201.
 - c. Pacific Polymers, Inc; Elast-Thane 227 Type 1 (Self-Leveling).
 - d. Polymeric Systems, Inc; PSI-270SL.
 - e. Tremco Commercial Sealants & Waterproofing; THC-901 or THC-900.
 - f. W. R. MEADOWS, Inc; POURTHANE SL.
 - g. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
 - B. Verify that backing materials are compatible with sealants.
 - C. Verify that backer rods are of the correct size.
-

- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 - 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 - 5. 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.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 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. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- E. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION 079200

**SECTION 079513
EXPANSION JOINT COVER ASSEMBLIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (DIR) - Online Certifications Directory.
- C. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.03 SUBMITTALS

- A. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- B. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- C. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal/Resilient Expansion Joint Cover Assemblies:
 - 1. Architectural Art Mfg, Inc.
 - 2. Balco, Inc.
 - 3. Construction Specialties, Inc.
 - 4. Inpro.
 - 5. MM Systems Corp.:
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Preformed Foam Expansion Joint Assemblies:
 - 1. Construction Specialties, Inc.
 - 2. EMSEAL Joint Systems, Ltd.
 - 3. MM Systems Corp.
 - 4. Schul International Company, Inc.
 - 5. Watson Bowman Acme Corp.
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. General: Provide 2-inch joint assemblies at all locations, unless otherwise indicated.
 - 1. Color for all joints shall be selected from manufacturer's full range of available colors.
- B. Interior Floor Joints (Metal; Surface Mounted): Serrated, anodized aluminum plate with exposed fasteners.
 - 1. Products: (Floor-to-floor and floor-to-wall models)

- a. Architectural Art Mfg; K20-11-11 and K20-31-11.
 - b. Balco; RPA-2 and RPAL-2.
 - c. Construction Specialties; PCS2G-200 and PCWS2G-200.
 - d. Inpro; 808-A01-050 and 808-A02-050.
 - e. MM Systems; X-U-2 and X-W-2.
- C. Interior Wall Joints (Metal; Surface Mounted): Smooth, satin anodized aluminum; with mounting flange on one side of joint and "snap-on" cover installation; no exposed fasteners.
- 1. Products: (Wall-to-wall and wall-to-corner models)
 - a. Architectural Art Mfg; G20-59-14 and G20-69-14.
 - b. Balco; WD-2 and WDC-2.
 - c. Construction Specialties; ASM-200 and ASMC-200.
 - d. Inpro; 811-A07-050 and 811-A09-050.
 - e. MM Systems; EX-K2 and EX-L2.
- D. Exterior Wall Joints (Preformed Foam): Pre-compressed and self-expanding, open-cell urethane foam. Pre-coated with water repellant coating on exterior surface, and with adhesive coating on sides to fit in opening. Joint shall allow for minimum 50% total movement (25% expansion, 25% contraction).
- 1. Products:
 - a. Construction Specialties; Model VF.
 - b. EMSEAL Joint Systems, Ltd.; Colorseal.
 - c. MM Systems; Series ESS.
 - d. Schul International Company, Inc.; Color Econoseal.
 - e. Watson Bowman Acme Corp; WeatherSeal II.
- E. Fire-Rated Horizontal Joints (Preformed Foam): Pre-compressed and self-expanding, open-cell urethane foam; suitable for exterior or interior joints. Pre-coated with water repellant coating on exterior surface, and with adhesive coating on sides to fit in opening. Material shall be 2 hour fire barrier, tested to UL 2079.
- 1. Products:
 - a. Construction Specialties; Model 2HFR.
 - b. EMSEAL Joint Systems, Ltd.; Emshield DFR2.
 - c. MM Systems; Model EIS-FR.
 - d. Schul International Company, Inc.; Sealtite 2FR-H.
 - e. Watson Bowman Acme Corp; Wabo FireShield FSH.

2.03 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
- 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- B. Exterior Joints at Cavity/Masonry Veneer Walls: Provide a "double" preformed foam joint at exterior joints, with aesthetic joint at face of veneer masonry, and a functional joint (manufacturer's standard neutral color) in the plane of insulation to maintain continuity of insulation and water and air barriers.
-

- C. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.
- D. Covers in Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
 - 1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.
- B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.
- B. Provide strippable coating to protect finish surface.

END OF SECTION 079513

**SECTION 081113
STEEL DOORS AND FRAMES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- B. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames.
- C. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.

1.02 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- C. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company.
 - 2. Curries, an Assa Abloy Group company.
 - 3. Fleming Door Products, an Assa Abloy Group company.
 - 4. Krieger Specialty Products.
 - 5. Mesker, dormakaba Group.
 - 6. Metal Products, Inc. (MPI)
 - 7. Pioneer Industries, Inc.; an Assa Abloy Group company.
 - 8. Republic Doors, an Allegion brand.
 - 9. Steelcraft, an Allegion brand.
 - 10. Technical Glass Products.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized 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. Door Top and Bottom Closures: Flush end closure channel, with top and door faces aligned.

- a. Inverted channel closure is acceptable for bottom edges and top edges of interior doors that are not exposed to view from above.
4. Door Edge Profile: Beveled edge.
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. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire-Rated: Fabricate from either cold-rolled steel sheet or metallic-coated steel sheet.
 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 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements, except kraft paper honeycomb core is not acceptable.
 3. Door Thickness: 1-3/4 inches, nominal.
- C. Fire-Rated Doors: Comply with NFPA 80.
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Match construction and physical performance levels above for interior or exterior doors, as applicable.
 2. Fire Rating: As indicated, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 3. Per NFPA 80, fire exit doors shall be labeled "Fire Door to Be Equipped with Fire Exit Hardware," and shall be reinforced and constructed to maintain the rating of the specific listed and labeled fire exit devices mounted on them.
 4. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
 5. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 6. Door Thickness: 1-3/4 inches, 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.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Face welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 3. Weatherstripping: Refer to Division 08 Section "Door Hardware".
- D. Interior Door Frames, Non-Fire Rated: Face welded type.
 - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, 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, minimum.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
 - 1. Where removable mullion is indicated, coordinate with removable mullion to be provided as an exit device accessory per Division 08 Section "Door Hardware."
- H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- I. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- J. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- K. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 - 1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 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: Sightproof inverted V- or Y-blade.
 - 3. Fasteners: Exposed or concealed fasteners.
- B. Glazing: As specified in Section 088000.

- C. Removable and Fixed Stops: Formed sheet steel, mitered or butted corners; prepared for countersink style tamper proof screws.
 - 1. Provide fixed stops for exterior applications, and toward the secure side of interior glazed lites (for example, toward the corridor or more public accessible spaces).
 - 2. Heights of Stops: Unless otherwise indicated or recommended by glazing manufacturer, provide standard 5/8-inch height stops where allowed by standards, and provide 3/4-inch height for exterior 1-inch glazing units.
- D. Astragals and Edges for Double Doors: Pairs of door astragals, and door edge sealing and protection devices.
 - 1. Provide UL listed products, complying with NFPA 80, and as required to maintain indicated fire rating.
 - 2. Provide surface mounted overlapping-type astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
- E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- F. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- G. 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.
- H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. 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. Install in accordance with ANSI/SDI A250.11.
 - 2. Do not remove temporary frame spreaders until after frames have been properly set and secured.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 087100.
- F. Comply with glazing installation requirements of Section 088000.
- G. Coordinate installation of electrical connections to electrical hardware items.

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.
 - 1. Comply with clearances indicated in NFPA 80 for fire-rated doors.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION 081113

**SECTION 081416
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- D. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- E. UL 10B - Standard for Fire Tests of Door Assemblies.
- F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.02 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- C. Selection Samples: Submit manufacturer's color charts indicating full range of available colors, for each product requiring color selection.
- D. Verification Samples: Submit three physical samples of door veneer, approximately 8 by 8 inches in size illustrating standard range of wood grain, stain color, and sheen.
- E. Warranty, executed in Owner's name.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Provide all flush wood doors from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Eggers Industries.
-

2. Lambton Doors.
3. Masonite Architectural; Aspiro Select Wood Veneer Doors.
4. Oshkosh Door.
5. VT Industries, Inc.

2.02 DOORS

- A. Doors: See drawings for locations and additional requirements.
 1. Doors shall be manufactured by the hot-press method, bonding faces, crossbands, and core together in a single operation with Type I glue. Doors manufactured by cold-pressing 2- or 3-ply pre-manufactured door skins to multiple cores in the same press will not be accepted.
 2. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS) or WDMA I.S. 1A.
 3. Wood Veneer Faced Doors: 5-ply or 7-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 1. Provide solid core doors at each location.
 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled.
 - a. Provide stile construction with concealed intumescent seals at pairs of doors, meeting required fire-ratings without the need of astragal or metal edge construction.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), particleboard Grade LD-2 per ANSI A 208.1; plies and faces as indicated.
 1. Provide structural-composite-lumber (SCLC) core for doors with glazing area cut out for 9-inch stile width doors.
 2. Provide structural-composite-lumber (SCLC) core for doors with exit devices.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 1. Vertical Edges: Any option allowed by quality standard for grade.
 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
 - B. Cores Constructed with stiles and rails:
 1. Provide solid blocks at lock edge for hardware reinforcement.
 - C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 - D. For doors indicated to be factory-finished, factory install glazing in doors in compliance with quality standards specified, using manufacturer's standard elastomeric glazing sealant.
-

- E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- G. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 5, Varnish, Conversion or System 11, catalyzed polyurethane.
 - b. Sheen: Satin.
- B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
- C. Factory finish doors in accordance with approved sample.
- D. Seal door top edge with color sealer to match door facing where doors will be exposed to view from above.

2.07 ACCESSORIES

- A. Wood Louvers:
 - 1. Material and Finish: Match species of door panels.
- B. Metal Louvers:
 - 1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.
 - 2. Louver Blade: Inverted V blade, sight proof, light proof; fire rated to indicated rating, with fusible link designed to UL requirements.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws. At fire-rated doors, provide noncombustible wood stops with concealed metal clips for indicated fire rating.
- D. Door Hardware: Refer to Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Install door louvers plumb and level.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION 081416

**SECTION 081613
FIBERGLASS DOORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 1304 - Voluntary Specification for Determining Forced Entry Resistance of Side-Hinged Door Systems.
- B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- D. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- E. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
- F. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- G. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- H. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- M. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- N. ICC (IBC) - International Building Code.
- O. ITS (DIR) - Directory of Listed Products.
- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- Q. UL (DIR) - Online Certifications Directory.
- R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.
- B. Shop Drawings: Indicate layout and profiles; include assembly methods.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
 2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.
- C. Selection Samples: Submit two complete sets of color charts, illustrating manufacturer's available finishes, colors, and textures.
- D. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- E. Maintenance Data: Include instructions for repair of minor scratches and damage.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Mark doors with door opening mark number, door type, color, and weight.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
1. Store at temperature and humidity conditions recommended by manufacturer.
 2. Do not use non-vented plastic or canvas shelters.
 3. Immediately remove wet wrappers.
- D. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.05 FIELD CONDITIONS

- A. Do not install doors until structure is enclosed.
- B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide twenty-five (25) year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. FRP/Aluminum Hybrid Doors and Frames: Basis of Design - Special-Lite, Inc; SL-17.
1. Kawneer Company, Inc; Flushline Entrances.
 2. Vale Doors; V-250.

2.02 DOOR AND FRAME ASSEMBLIES

- A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
1. Operation: Refer to Drawings and Section 087100 - Door Hardware.
 2. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.

3. Screw-Holding Capacity: Tested to 890 pounds, minimum.
 4. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
 5. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
 6. Clearance Between Door and Frame: 1/8 inch, maximum.
 7. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
 8. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.
 9. Provide frame anchors that allow for variation in rough opening size; field cutting of doors or frames to fit is not permitted.
- B. Fire-Rated Doors and Frames: Comply with fire-ratings as indicated on drawings.
1. Tested in accordance with ICC (IBC) for positive pressure or UL 10C.
 2. ITS (DIR) or UL (DIR) listed and labeled.

2.03 COMPONENTS

- A. Doors: Fiberglass/Aluminum hybrid construction with reinforced core.
1. Type: As indicated on drawings, including swinging and sliding doors.
 2. Thickness: 1-3/4 inch, nominal.
 3. Core Material: Manufacturer's standard core material for application indicated.
 4. Construction:
 - a. Fiberglass faces, 0.120 inch thick, attached to integral reglets in extruded aluminum stiles and rails for flush appearance. Use of glue is not permitted.
 5. Face Sheet Texture: Pebble grain.
 6. Door Panel Configuration: As indicated on drawings.
 7. Subframe and Reinforcements: Manufacturer's standard materials Aluminum extrusions.
 8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
 9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.
- B. Door Frames: Provide type in compliance with performance requirements specified for doors.
1. Type: Knock-down type for field assembly.
 2. Profiles: As indicated on drawings.
 3. Door Stop: 5/8 inch wide, by 1-7/8 inches deep.
 4. Non-Fire-Rated:
 - a. Aluminum, 0.04 inch minimum wall thickness; coated to match storefront finish.
 5. Fire-Rated: Provide frames bearing labels to match doors.
 - a. Aluminum, 0.04 inch minimum wall thickness; coated to match storefront finish.
 6. Mullions: Fixed, fiberglass centerpost; 2 inches wide by 2-3/4 inches deep, nominal.
 7. Corner Joints: Mitered with concealed corner blocks or angles of same material as frame; fiberglass and aluminum joined with screws; steel and stainless steel spot welded; sealed watertight with silicone sealant; field assemble knock-down type frames as required.
 8. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.

9. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches with one additional anchor for each additional 24 inches in height.
10. Reinforcing: Provide manufacturer's standard reinforcing at hinge, strike, and closer locations.

2.04 PERFORMANCE REQUIREMENTS

- A. 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 side hinged doors.
- B. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 and Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
- C. Forced Entry Resistance: Pass in accordance with AAMA 1304 test method.
- D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf.
- E. Air Leakage: Maximum of 0.1 cfm per square foot at 6.27 psf differential pressure, when tested in accordance with ASTM E283.
- F. Structural Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
- G. Thermal Transmittance, Exterior Doors: AAMA 1503, U-value of 0.35, maximum, measured on exterior door in size required for this project.
- H. Fiberglass Reinforced Plastic (FRP) Face Sheet Properties:
 1. Izod Impact Resistance: ASTM D256, 7 foot-pound force per inch of width, minimum, with notched izod.
 2. Tensile Strength at Break: ASTM D638, 13,250 psi, minimum.
 3. Water Absorption: ASTM D570, 0.16 percent, maximum, after 24 hours at 74 degrees F.
 4. Flexural Strength: ASTM D790, 27,000 psi, minimum.

2.05 FINISHES

- A. Primer: Aliphatic urethane for field finishing.

2.06 HARDWARE

- A. Door Hardware: See Section 087100 - Door Hardware.

2.07 ACCESSORIES

- A. Stops for Glazing and Louver: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
 1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
 2. Glazed Openings: Provide removable stops on interior side.
 3. Fire-Rated Doors: Provide stop kit listed by labeling authority.
 4. Opening Sizes and Shapes: As indicated on drawings.
- B. Glazing: See Section 088000 - Glazing.
- C. Louvers for Non-Fire-Rated Doors: Same materials, construction, finish, and color as door; fixed vanes, 45 degree sloped vanes.

- D. Louvers for Fire-Rated Doors: UL (DIR) listed and labeled self-closing fire damper louvers actuated with fusible link; galvanized steel with overlapping trim frame both sides of door.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.
- B. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean and prepare substrate in accordance with manufacturer's directions.
- C. Protect adjacent work and finish surfaces from damage during installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.
- B. Install fire-rated assemblies in accordance with NFPA 80.
- C. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.
- D. Set thresholds in continuous bed of sealant.
- E. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.
- F. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- G. Repair or replace damaged installed products.

3.04 ADJUSTING

- A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.
- B. Adjust hardware for smooth and quiet operation.
- C. Adjust doors to fit snugly and close without sticking or binding.

3.05 CLEANING

- A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 081613

**SECTION 083100
ACCESS DOORS AND PANELS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (FRD) - Fire Resistance Directory.

1.02 SUBMITTALS

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit.
 - 1. Include a schedule indicating wall/ceiling type, door types, sizes, and hardware for each access door required.

1.03 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.
 - 1. This (083100) material specification includes access doors required for Divisions 21 (Fire Suppression), Division 22, (Plumbing), 23 (HVAC) and Division 26 (Electrical) work and any other access doors indicated on Drawings.

PART 2 PRODUCTS

2.01 WALL- AND CEILING-MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. Activar Construction Products Group, Inc. - JL Industries.
 - 2. ACUDOR Products Inc.
 - 3. Babcock-Davis.
 - 4. Best Access Doors.
 - 5. Cendrex, Inc.
 - 6. Karp Associates, Inc.
 - 7. Larsen's Manufacturing Company.
 - 8. Milcor, Inc.
 - 9. Nystrom, Inc.
 - 10. Williams Brothers Corporation of America.
 - 11. Substitutions: See Section 016000 - Product Requirements.
- B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Material: Steel.
 - 2. Style (Gypsum Board locations): Recessed door panel for infill with wall/ceiling finish.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 - 3. Style (Masonry locations): Exposed frame, with door surface flush with frame surface.
 - 4. Door Style: Double-skinned hollow panel.

5. Frames: 16-gauge, 0.0598-inch minimum thickness.
6. Double-Skinned Hollow Steel Sheet Door Panels: 16-gauge, 0.059-inch minimum thickness, on both sides and along each edge.
7. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
 - b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
 - c. Fire-rated door assemblies shall conform with and be installed in accordance with (1) NFPA 80, (2) door and frame manufacturer's installation instructions, and (3) listing requirements of qualified testing agency.
8. Steel Finish: Primed.
9. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 083100

**SECTION 083313
COILING COUNTER DOORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.
- B. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.
- C. Samples: Submit manufacturer's color charts indicating standard range of powder coat finishes.

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide two-year manufacturer warranty for materials and workmanship for all components of coiling doors. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Coiling Counter Doors:
 - 1. Alpine Overhead Doors, Inc.
 - 2. Amarr.
 - 3. C.H.I. Overhead Doors.
 - 4. Clopay Building Products.
 - 5. Cornell Iron Works, Inc.
 - 6. McKeon Rolling Steel Door Co., Inc.
 - 7. Overhead Door Corporation.
 - 8. Raynor Garage Doors.
 - 9. The Cookson Company.
 - 10. Wayne-Dalton, a Division of Overhead Door Corporation.
 - 11. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING COUNTER DOORS

- A. Coiling Counter Doors, Non-Fire-Rated: Galvanized steel slat curtain.
 - 1. Mounting: Between jambs, within prepared opening.
 - 2. Provide integral frame of same material and finish.
 - 3. Sill: Not required; stainless steel countertops shall be provided as part of foodservice equipment. Coordinate with Section 114400 - Foodservice Equipment.

4. Nominal Slat Size: 1-1/4 inches wide.
5. Slat Profile: Flat.
6. Finish, Galvanized Steel: Factory powder coated.
7. Color: To be selected by Architect from manufacturer's standard range. Coordinate to match with adjacent coiling doors.
8. Guides: Formed track; same material and finish unless otherwise indicated.
9. Hood Enclosure: Manufacturer's standard; galvanized steel. Finish to match slats.
10. Manual push up operation.
11. Locking Devices: Slide bolt on inside.

2.03 COMPONENTS

- A. Metal Curtain Construction: Interlocking, single-thickness slats.
 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position; neoprene astragal along bottom edge.
 3. Steel Slats: ASTM A653/A653M galvanized steel sheet, with minimum G60/Z180 coating; minimum thickness 16 gauge, 0.06 inch.
- B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
 1. Guides for Galvanized Curtains: ASTM A36/A36M steel angles, size as indicated, hot-dip galvanized per ASTM A123/A123M.
- C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
- D. Lock Hardware:
 1. Slide Bolt: Provide on single-jamb side, extending into slot in guides.
- E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that electrical services have been installed and are accessible.
- C. Verify that door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of any unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

3.06 INITIAL MAINTENANCE CONTRACT

- A. Provide an Initial Maintenance Contract for maintenance of coiling door system and components for a period of 12 months. Maintenance shall include maximum quarterly intervals (minimum of 4 visits for initial contract), and shall include adjustment, lubrication, and other preventive maintenance, and repair or replacement of defective or worn parts or equipment.
 - 1. Provide service during regular working hours throughout period of this maintenance contract.

END OF SECTION 083313

**SECTION 083323
OVERHEAD COILING DOORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of coiling doors with size, location and installation of service utilities, including electrical, access control, and smoke/fire alarm, as required.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. Product Data: Provide general construction, electrical equipment, and component connections and details.
 - 1. Include product data for automatic closing device for fire shutter application, with testing and resetting instructions.
- B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
 - 1. Include diagrams indicating motors, controls, and electrical wiring.
 - 2. Indicate coordination with smoke and/or fire alarm systems, and show locations of detectors, replaceable fusible links, and release devices.
- C. Selection Samples: Manufacturer's color charts, showing full range of factory finishes.
- D. Verification Samples: Manufacturer's standard size sample on curtain slat material indicated.
- E. Installer's qualification statement.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide two (2) year manufacturer warranty for materials and workmanship for all components of coiling doors. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Alpine Overhead Doors, Inc.
 - 2. Amarr.
 - 3. C.H.I. Overhead Doors.
-

4. Clopay Building Products.
5. Cornell Iron Works, Inc.
6. McKeon Rolling Steel Door Co., Inc.
7. Overhead Door Corporation.
8. Raynor Garage Doors.
9. The Cookson Company.
10. Wayne-Dalton, a Division of Overhead Door Corporation.
11. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
 1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components.
 2. Sandwich Slats: Manufacturer's standard, with core of foamed-in-place polyurethane insulation; minimum R-value of 4.88.
 - a. Surface Burning Characteristics: Provide insulation with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 3. Slat Size: Manufacturer's standard height and thickness to meet performance requirements; length as required for rough opening width indicated.
 4. Guide, Angles: Powder coated steel.
 5. Hood Enclosure: Manufacturer's standard; powder coated steel.
 6. Manual push up operation.
 - a. Provide push/pull handles mounted to inside face of bottom slat.
 7. Mounting: Surface mounted.
 8. Locking Devices: Slide bolt on inside, with padlock hasp (Padlock NIC).
 9. Finish: As selected by Architect from manufacturer's full range of powder coat finishes.

2.03 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking slats.
 1. Curtain Bottom for Slat Curtains: Fitted with steel angles to provide reinforcement and positive contact in closed position; powder coated to match curtain slats.
 2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
 3. Steel Slats: Minimum thickness, 22 gauge, 0.0299 inch; ASTM A653/A653M galvanized steel sheet.
 - a. Galvanizing: Minimum G90 coating.
 - B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.
 - C. Guides - Angle: Two ASTM A36/A36M metal angles, size as required for wind loading, but not less than 1-1/2 by 1-1/2 by 1/8 inch.
 1. Powder coated to match curtain slats.
 - D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
 1. Minimum Thickness: 0.028-inch; ASTM A653/A653M galvanized steel sheet with G90 coating.
 2. Provide with end mounting brackets and with intermediate reinforcing brackets to prevent sagging.
-

3. Powder coated to match curtain slats.
- E. Lock Hardware:
 1. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.
- F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that electrical services have been installed and are accessible.
- C. Verify that door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of any unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Install enclosure and perimeter trim.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.
- B. Adjust seals around entire perimeter to ensure a weather-tight installation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

3.06 INITIAL MAINTENANCE CONTRACT

- A. Provide an Initial Maintenance Contract for maintenance of coiling door system and components for a period of 12 months. Maintenance shall include maximum quarterly intervals (minimum of 4 visits for initial contract), and shall include adjustment, lubrication, and other preventive maintenance, and repair or replacement of defective or worn parts or equipment.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Provide service during regular working hours throughout period of this maintenance contract.

END OF SECTION 083323

**SECTION 084313
ALUMINUM-FRAMED STOREFRONTS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. 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.
- I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- K. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.02 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.

1.03 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- C. Selection Samples: Submit manufacturer's color charts representing manufacturer's full range of available colors, for each type of product required.
- D. Verification Samples: Submit physical samples in manufacturer's standard size indicating actual panel material and selected colors, for each type of product required.
- E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

- G. Designer's qualification statement.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 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.

1.05 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.06 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.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Material/Labor Warranty: Provide a 2-year material and workmanship warranty, covering failures including but not limited to, structural and performance failures, excessive material deterioration, failure of operating components, and water or air infiltration. Complete forms in Owner's name and register with warrantor.
- C. Finish Warranty: Provide 10-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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aluminum-Framed Storefront - Exterior - Single Thermal Break - Center Set - 2" x 4.5":
 - 1. EFCO Corp; 403T.
 - 2. Kawneer North America; 451T.
 - 3. Oldcastle Building Envelope; 3000 Thermal.
 - 4. Tubelite, Inc; T14000 Thermal.
 - 5. YKK AP America, Inc; YES 45 TU.
 - B. Aluminum-Framed Storefront - Interior - Non-Thermal - Center Set - 2" x 4.5":
 - 1. EFCO Corp; 402.
 - 2. Kawneer North America; Trifab VG 451.
 - 3. Oldcastle Building Envelope; FG 3000.
 - 4. Tubelite, Inc; E14000 Non-Thermal.
-

5. YKK AP America, Inc; YES 45 FI.
- C. Aluminum-Framed Entrances - Heavy-Duty 2-inch Thick - Insulated - Wide-Stile:
1. EFCO Corp; D518 Durastile.
 2. Kawneer North America; 500 Heavy Wall Entrance.
 3. Oldcastle Building Envelope; Rugged Entrance.
 4. Tubelite, Inc; Monumental Wide Stile Doors.
 5. YKK AP America, Inc; 50M.

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 Position: Centered (front to back).
 2. 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.
 3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 4. 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.
 5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- 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 and as indicated on Structural drawings.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
 3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
 4. Condensation Resistance Factor of Framing: 56, minimum, measured in accordance with AAMA 1503.
 5. Overall U-value Including Glazing: 0.42 Btu/(hr sq ft deg F), maximum.
 6. Overall U-value of Operable Entry Doors Including Glazing: 0.77 Btu/(hr sq ft deg F), maximum.
 7. Solar Heat Gain Coefficient (SHGC) Including Glazing: 0.25, maximum, measured in accordance with NFRC 200.
-

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.
- B. Glazing: Refer to Section 088000.
- C. Infill Panels (Glazing Type G3): Insulated, aluminum, with edges formed to fit glazing channel and sealed.
 - 1. Total Nominal Thickness: 1 inch.
 - 2. Surface Burning Characteristics: Provide assemblies with Class A rating, with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 3. Face Sheets (Front and Back): Equal 0.024-inch smooth aluminum faces bonded to nominal 1/8-inch exterior grade hardboard or high-density corrugated polypropylene.
 - 4. Core: Rigid polyisocyanurate insulation core; minimum total panel R-value of 6.
 - 5. Finish: Same as storefront.
 - 6. Products:
 - a. Citadel Architectural Products; GlazeGuard 1000 WR+.
 - b. Laminators, Inc; Thermolite/Omega Foam-Ply.
 - c. Mapes Architectural Products; Mapes-R Infill.
 - d. Substitutions: See Section 016000 - Product Requirements.
- D. Swing Doors - Exterior: Glazed FRP/Aluminum hybrid doors. See Section 081613 - Fiberglass Doors.
- E. Swing Doors - Interior: Glazed aluminum.
 - 1. Thickness: 1-3/4 inches.
 - 2. Top Rail: 7 inches wide.
 - 3. Vertical Stiles: 5 inches wide (wide stile).
 - 4. Bottom Rail: 12 inches wide.
 - 5. Glazing Stops: Beveled.
 - 6. Finish: Same as storefront.

2.04 MATERIALS AND ACCESSORIES

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Metal Extrusions and Accessories:
 - 1. Metal Trim, Filler, and Closures (Brake Metal): Form interior filler panels for closing ends of partition systems, concealing adjacent structural elements, and for other applications as indicated on Drawings. Form from minimum 0.050-inch aluminum sheet coil, producing a panel of same thickness as partitions or mullions unless otherwise indicated. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces. Finish trim to match storefront unless otherwise indicated.
 - 2. Offset Anchorage System: Provide frame anchorage incorporating L-shaped offset anchors and finished extruded interlocking L-shaped cover trim matching storefront framing. Anchorage "clip and cover" system shall be engineered by storefront manufacturer.

- 3. Enhanced (High Performance) Sill Flashing: Provide thermally-broken extruded aluminum sill flashing with 2-inch tall back leg and bottom profile with outboard trough and weep holes to direct water to exterior. Provide full-frame-depth end dams mechanically attached to sill flashing extrusion and sealed with silicone. Provide silicone sill flashing splice sleeves and sealant as required at end dams and penetrations for anchorage. Provide finish to match framing.
- D. Sill Flashing Sealant: Elastomeric silicone; compatible with flashing material.
- E. Sealant for Setting Thresholds: Non-curing butyl type.
- F. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Color: To be selected by Architect from manufacturer's full range.

2.06 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip, and threshold.
- B. Other Door Hardware: Refer to Section 087100.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior doors.

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. Set thresholds in bed of sealant and secure.

- J. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 088000.
- 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 non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

3.05 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.06 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.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084313

**SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
- B. AAMA 501.4 - Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- K. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- M. 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.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- P. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.02 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.

1.03 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

- C. Selection Samples: Submit manufacturer's color charts representing manufacturer's full range of available colors, for each type of product required.
- D. Verification Samples: Submit physical samples in manufacturer's standard size indicating actual panel material and selected colors, for each type of product required.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
- G. Designer's Qualification Statement.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

1.05 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.

1.06 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Material/Labor Warranty: Provide a two (2) year material and workmanship warranty, covering failures including but not limited to, structural and performance failures, excessive material deterioration, failure of operating components, and water or air infiltration. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glazed Aluminum Curtain Wall - Exterior - Aluminum Pressure Plates - Front Set - 2.5" x 6":
 - 1. EFCO Corp; 5600.
 - 2. Kawneer North America; 1600 System 1.
 - 3. Oldcastle Building Envelope; Reliance Thermal.
 - 4. Tubelite, Inc; 400CW Curtainwall.
 - 5. YKK AP America, Inc; YCW 750.
 - B. Aluminum-Framed Entrances - Heavy-Duty 2-inch Thick - Insulated - Wide-Stile:
 - 1. EFCO Corp; D518 Durastile.
 - 2. Kawneer North America; 500 Heavy Wall Entrance. (Basis of Design)
 - 3. Oldcastle Building Envelope; Rugged Entrance.
-

4. Tubelite, Inc; Monumental Wide Stile Doors.
 5. YKK AP America, Inc; 50M.
- C. Curtain Wall Door Panels - Exterior: FRP/Aluminum hybrid. See Section 081613 - Fiberglass Doors.

2.02 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Outside glazed, with pressure plate and mullion cover, where indicated on drawings.
 2. Fabrication Method: Field fabricated stick system.
 3. Glazing Method: Field glazed system.
 4. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 7. 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.
 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Comply with the requirements of ASCE 7 and as indicated on Structural drawings.
 - a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
 - b. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
 2. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through three complete cycles.
 3. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 12 psf.

2. Test Method: ASTM E331.
- D. Air Leakage: 0.06 cfm/sq ft maximum leakage of wall area when tested in accordance with ASTM E283/E283M at 6.24 psf pressure difference across assembly.
- E. Thermal Performance Requirements:
 1. Condensation Resistance Factor of Framing: 56, minimum, measured in accordance with AAMA 1503.
 2. Overall U-value Including Glazing: 0.45 Btu/(hr sq ft deg F), maximum.
 3. Overall U-value of Operable Entry Doors Including Glazing: 0.77 Btu/(hr sq ft deg F), maximum.
 4. Solar Heat Gain Coefficient Including Glazing: 0.25, maximum, measured in accordance with NFRC 200.

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. Framing members for interior applications need not be thermally broken.
 2. Cross-Section: As indicated on drawings.
 3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: Refer to Section 088000.
- C. Infill Spandrel Panels (Glazing Type G3): Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
 1. Surface Burning Characteristics: Provide assemblies with Class A rating, with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 2. Products:
 - a. Citadel Architectural Products; GlazeGuard 1000 WR+.
 - b. Laminators, Inc; Thermolite/Omega Foam-Ply.
 - c. Mapes Architectural Products; Mapes-R Infill.
 3. Total Panel Thickness: 1 inch.
 4. Face Sheets (Front and Back): Equal 0.024-inch smooth aluminum faces bonded to nominal 1/8-inch exterior grade hardboard or high-density corrugated polypropylene.
 5. Core: Rigid polyisocyanurate insulation core; minimum total panel R-value of 6.
 6. Finish: Same as curtain wall.
 7. Products:
 - a. Citadel Architectural Products; GlazeGuard 1000 WR+.
 - b. Laminators, Inc; Thermolite/Omega Foam-Ply.
 - c. Mapes Architectural Products; Mapes-R Infill.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
 - B. Sheet Aluminum: ASTM B209/B209M.
 - C. Structural Steel Sections (Reinforcing): 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. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.
-

- F. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness or sheet aluminum, 22 gauge, 0.026 inch minimum thickness.
- G. Firestopping: Refer to Section 078400.
- H. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.
- I. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.
- J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- K. Glazing Accessories: Refer to Section 088000.
- L. 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 thick.
- B. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that curtain wall openings and adjoining water-resistive and air barrier seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Install firestopping at each floor slab edge in accordance with tested assembly.
- H. Pressure Plate Framing: Install glazing and infill panels using exterior dry glazing method; see Section 088000.
- I. 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 noncumulative or 0.5 inches per 100 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Provide services of curtain wall manufacturer's technical representative to inspect for proper installation of system and submit report.

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, take care to remove dirt from corners, and wipe surfaces clean.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084413

**SECTION 087100
DOOR HARDWARE**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. BHMA A156.1 - Standard for Butts and Hinges 2021.
- C. BHMA A156.3 - Exit Devices 2020.
- D. BHMA A156.4 - Door Controls - Closers 2019.
- E. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
- F. BHMA A156.6 - Standard for Architectural Door Trim 2021.
- G. BHMA A156.7 - Template Hinge Dimensions 2016.
- H. BHMA A156.8 - Door Controls - Overhead Stops and Holders 2021.
- I. BHMA A156.13 - Mortise Locks & Latches Series 1000 2017.
- J. BHMA A156.16 - Auxiliary Hardware 2018.
- K. BHMA A156.21 - Thresholds 2019.
- L. BHMA A156.22 - Standard for Gasketing 2021.
- M. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.
- N. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.
- O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
- P. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
- Q. DHI (KSN) - Keying Systems and Nomenclature 2019.
- R. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- S. ITS (DIR) - Directory of Listed Products Current Edition.
- T. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- V. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.
- W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- X. UL (DIR) - Online Certifications Directory Current Edition.
- Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.02 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. Schedule meeting at project site prior to Contractor occupancy.
 2. Attendance Required:
 1. Contractor.
 2. Owner.
 3. Architect.
 4. Installer's Architectural Hardware Consultant (AHC).
 5. Door Hardware Installer.
 6. Owner's Security Consultant.
 3. Agenda:
 1. Establish keying requirements.
 2. Verify locksets and locking hardware are functionally correct for project requirements.
 3. Verify that keying and programming complies with project requirements.
 4. Establish keying submittal schedule and update requirements.
 4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 1. Access control requirements.
 2. Key control system requirements.
 3. Schematic diagram of preliminary key system.
 4. Flow of traffic and extent of security required.
 5. 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.
 6. Deliver established keying requirements to manufacturers.

1.03 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.
 1. 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. Samples for Verification:
 1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
 2. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
 3. Include product description with samples.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Supplier's qualification statement.
- J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- K. Keying Schedule:
 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 - Product Requirements, for additional provisions.

1.04 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.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.06 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: 30 years minimum.
 2. Exit Devices: Five years, minimum.
 3. Locksets: Limited lifetime.
 4. Cylinders: Three years, 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. Overhead Stops and Holders (Door Checks):
 - 1. Provide stop for every swinging door, unless otherwise indicated.
 - 2. Overhead Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.
 - 3. Overhead stop is not required if a floor or wall stop has been specified for the door.
- E. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.
- F. 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.
- G. 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.
- H. See Section 281000 for additional access control system requirements.
- I. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - 1. Aluminum fasteners are not permitted.
 - 2. 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.
 - 1. 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.
 - 1. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - 2. 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 (Indicated as "S" on Drawings): 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 (BE)
 2. Hager
 3. McKinney
- B. Properties:
 1. Butt Hinges: As applicable to each item specified.
 1. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
 2. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
 3. Template screw hole locations.
 4. Bearing assembly installed after plating.
 5. Bearings: Exposed fully hardened bearings.
 6. Bearing Shells: Shapes consistent with barrels.
 7. Pins: Easily seated, non-rising pins.
 - 1) Fully plate hinge pins.
 - 2) Non-Removable Pins: Slotted stainless steel screws.
 8. UL 10C listed for fire-resistance-rated doors.
- 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. Grades:
 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
- E. Material: Base metal as indicated for each item by BHMA material and finish designation.
- F. Types:
 1. Butt Hinges: Include full mortise hinges.
- G. 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.
 1. Hinge weight and size unless otherwise indicated in hardware sets:
 - 1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 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 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
 - 3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.

- 4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.

H. Products:

1. Butt Hinges:
 1. Ball Bearing, Five (5) Knuckle.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. National Guard Products (NA)
2. BEST
3. ABH

B. Properties:

1. Continuous Hinges: As applicable to each item specified.
 1. Geared Continuous Hinges: As applicable to each item specified.
 - 1) Non-handed.
 - 2) Anti-spinning through-fastener.
 - 3) UL 10C listed for fire-resistance-rated doors.
 - (a) Metal Door Installation: Rated up to 90 minutes.
 - (b) Wood Door Installation: Rated up to 60 minutes.
 - 4) Sufficient size to permit door to swing 180 degrees

C. Grades:

1. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

D. Sizes: See Door Hardware Schedule.

1. Hinge Widths: As required to clear surrounding trim.
2. Sufficient size to allow 180 degree swing of door.

E. Code Compliance:

1. As required by authorities having jurisdiction in the State in which the Project is located.

F. Products:

1. HD1400A Series (1-3/4" thick doors)
2. HD2700A Series (2" thick doors)

2.05 REINFORCING PIVOT HINGES

- A. Provide as specified.

2.06 BOLTS

A. Manufacturers:

1. Trimco (TR)
2. Baldwin
3. Burns

B. Properties:

1. Auto Flush Bolts:
 1. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.

C. Products:

1. Provide as specified

2.07 COORDINATORS

A. Manufacturers:

1. Trimco (TR)
 2. Baldwin
 3. Burns
- B. Properties:
1. General: Non-handed devices, with field-selectable active door leaf.
 2. Active door to be field-selectable.
 3. Coordinators: Devices on pairs of doors with closers and self-latching or automatic flush bolts installed.
 1. Coordinator Operation: Only when inactive door is opened.
- C. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
1. Meet UL 10C for Positive Pressure.
 2. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshall.
- D. Types:
1. Coordinators: Bar.
- E. Installation:
1. Mounting: Provide necessary mounting brackets and filler bars to ensure proper installation of coordinator and related hardware.
 1. Pull Side: Mount with electrically-held single-point hold open for the inactive door from approximately 80 to 130 degrees.
 2. Push Side: Mount with electrically-held selective single-point hold open function for the active and inactive doors from approximately 80 to 120 degrees.
 2. Coordination: Properly sequence installation of other door hardware affected by placement of coordinators and carry bars.
- F. Products:
1. 3090 Series.

2.08 EXIT DEVICES

- A. Manufacturers:
1. BEST (PR)
 2. Detex
 3. Von Duprin
- 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 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:
 1. Non-Fire-Resistance-Rated Devices: Hex key 1/4 inch (6 mm) hex key dogging.
 2. Fire-Resistance-Rated Devices: Manual dogging not permitted.
 9. Touch bar assembly on wide style exit devices to have a 1/4 inch clearance to allow for vision frames.
 10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
 11. Hanging: 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. Electrified Devices:
 2. Internally mounted switch used to signal other components.
 3. Internally mounted switch that monitors the position of the latchbolt.
 4. MLR: Motorized latch retraction.
- E. Code Compliance:
1. As required by authorities having jurisdiction in the State in which the Project is located.
- F. Products:
1. 2000 Series

2.09 REMOVABLE MULLIONS

- A. Manufacturers:
1. BEST (PR)
 2. Detex
 3. Von Duprin
- B. Properties:
1. Rectangular shape 3 inches (76 mm) by 2 inches (51 mm) tubes with minimum 1/8 inch 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.
 1. Mullions capable of being installed without physical key present.
 2. 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.

2.10 LOCK CYLINDERS

- A. Manufacturers:
1. BEST (BE)
 2. Substitutions: Not permitted.
- B. Properties:
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 1. Provide cylinders from same manufacturer as locking device.
 2. Provide cams and/or tailpieces as required for locking devices.

3. 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.
 1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1C - 7-pin cores.
- 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.
 1. 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.

2.11 MORTISE LOCKS

- A. Manufacturers:
 1. BEST (BE) See Owner's Preferred Hardware Alternate
 2. Schlage
 3. Sargent
- B. Properties:
 1. Mechanical Locks: Manufacturer's standard.
 1. Fitting modified ANSI A115.1 door preparation.
 2. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
 3. Latch: Anti-friction, self-lubricating stainless steel.
 - 1) Latchbolt Throw: 3/4 inch minimum.
 4. Auxiliary Deadlatch: One-piece stainless steel, permanently lubricated.
 5. Backset: 2-3/4 inch.
 6. Lever Trim:
 - 1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
 - 2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - 3) Spindle: Designed to prevent forced entry from attacking of lever.
 - 4) Independent spring mechanism for each lever.
 - (a) Trim to be self-aligning and thru-bolted.
 - 5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
 - 6) Levers to operate a roller bearing spindle hub mechanism.
 2. Electrified Locks: Same properties as standard locks, and as follows:
 1. Voltage: 24 VDC.
 2. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.
- C. Finishes: See Door Hardware Schedule.
 1. Core Faces: Match finish of lockset.
- D. Grades:

1. Comply with BHMA A156.13, Grade 1.
- E. Options:
 1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.
- F. Products: Mortise locks, including standard and electrified types.
 1. 40H Series

2.12 AUXILIARY LOCKS (DEADLOCKS)

- A. Manufacturers:
 1. BEST (BE) See Owner's Preferred Hardware Alternate
 2. Schlage
 3. Sargent
- B. Properties:
 1. Backset: 2-3/4 inch (70 mm), unless otherwise indicated.
 2. Strike: Appropriate for door frame.
 3. Mortise Deadbolt: Manufacturer's standard, adjustable to accommodate range of door thickness indicated.
 1. Door Thickness Fit: 1-3/4 inches (44 mm) to 2-1/4 inches (57 mm) thick doors.
 2. Bolt Throw: 1 inch (25.4 mm) stainless steel.
 3. UL listed for up to 3 hours.
 4. Cylindrical Deadbolt: Manufacturer's standard, adjustable to accommodate range of door thicknesses indicated.
 1. Door Thickness Fit: 1-3/8 inches (35 mm) to 2 inches (51 mm) thick doors.
 2. Bolt Throw: 1 inch (25.4 mm) hardened steel.
 3. UL listed for up to 3 hours.
 4. Thumb Turns: Meet requirements of accessibility codes and regulations.
- C. Grades:
 1. Mortise Deadbolts: Tested and approved by BHMA A156.36, Operational Grade 1.
 2. Cylindrical Deadbolts: Tested and approved by BHMA A156.36, Operational Grade 2.
- D. Products:
 1. 48/49H (Mortise).

2.13 CLOSERS

- A. Manufacturers:
 1. BEST (BE)
 2. LCN 4040
 3. Norton 7500
- B. Properties:
 1. Surface Mounted Closers: Manufacturer's standard.
 1. Construction: Cast iron.
 2. Maximum Projection from Face of Door: 2-7/16 inches.
 3. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
 - 1) Include delayed action feature.
 4. Hydraulic Fluid: All-weather type.
 5. Arm Assembly: Standard for product specified.
 - 1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
 6. Covers:
 - 1) Type: Standard for product selected.
 - (a) Full.

- 2) Material: Plastic.
- 3) Finish: Painted.
- C. Grades:
 - 1. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Underwriters Laboratories Compliance:
 - 1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 - (a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
- D. 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 outswinging 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.
- E. Products:
 - 1. Surface Mounted:
 - 1. EHD9000

2.14 SWINGING DOOR OPERATORS

- A. Manufacturers:
 - 1. Dormakaba
 - 2. LCN
- B. Properties:
 - 1. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each individual leaf. Control both doors with actuators simultaneously at pairs. Locate actuators, key switches, and other controls as directed by Architect.
 - 2. Automatic Door Configuration:
 - 1. Configuration: Single swing door or pair of doors swinging.
 - 2. Traffic Pattern: As shown on drawings.
 - 3. Mounting: Surface applied.
 - 3. Low Energy Operators:
 - 1. Construction: Manufacturer's standard units with fine covers.
 - 2. Door Operation Limits:
 - 1) Weight: 220 lbs
 - 2) Width: 48 inches
 - 3) Temperature Range: 5 to 122 degrees F (Minus 15 to 50 degrees C).
 - 3. Function Adjustability: Selectable low-energy or power-assist applications. Low-energy function to cycle the door open as programmed. Power-assist function for decreased opening force when manually operated. Operator to have a programmable push-and-go functionality.
 - 4. Auxiliary Power Supply: 24VDC, 1.5A and form C relay contact for controlling fail safe/secure locking devices 50VAC or DC at 1A max.
 - 5. Programmable Operation: Include sweep speed, latch speed, and backcheck cushioning.
 - 6. Power-Open Functions: Include delay time, opening time, opening force, and opening angle.
 - 1) Angle and door width selector.

- 2) Power boost feature.
4. Additional Options:
 1. On-board cycle counter.
 2. Selectable jumper to accommodate push or pull side applications.
 3. On/off strike delay when the operator must delay while a locking device releases.
 4. Selectable on/off obstacle detection on closing.
 5. Wind Load and Stack Pressure microprocessor monitored with power boost to ensure secure opening and closing in changing conditions
 6. Power-hold Close
 7. Built in Lock Delay
 8. On-Off-Hold Open switch control to control door function, (Automatic-Hold Open- Exit Only)
 9. On-Off Power Switch
 10. Fire Alarm Integration
 11. Field Adjustable Handing
 12. Push and Go
 13. Power Assist Opening Activation
 14. Integrated access control
5. Actuators:
 1. Touchless
 2. Hard-Wired
 3. Normally open switch. (tied to exit device switch)
 4. Manufacturer: RCI
6. Bollards: (as required)
 1. Hard-wired Units
 2. Construction: Stainless-steel
 3. Coordinate with actuators
 4. Location: As directed by Architect.
 5. Manufacturer: Wikk
- C. Grades:
 1. Comply with BHMA A156.19.
 2. Underwriters Laboratories Compliance:
 1. Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
 2. United States: UL 325.
- D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
- E. Types:
 1. Low-Energy Operators:
- F. Installation:
 1. Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator. Locate the actuators, key switches, and other controls as directed by Architect.
 2. Operators: Hard-wire every unit.
 3. Operator Actuators: Include required back boxes, mounting rings, accessories as needed for fixed unit installation.
- G. Products:
 1. ED100LE Series

2.15 OVERHEAD STOPS AND HOLDERS

- A. Manufacturers:

1. ABH Manufacturing (AB)
 2. Rixson
 3. Sargent
- B. Properties:
- C. Sizes: Manufacturer's standard for the application.
- D. Finishes:
1. Arms and Brackets: Zinc-plated.
- E. Grades: As applicable to item specified.
1. Comply with BHMA A156.8, Grade 1.
- F. Material: Base metal as indicated for each item by BHMA material and finish designation.
1. Track Channel: Extruded aluminum alloy.
 2. Slide Block: Machined from solid brass alloy.
- G. Types:
1. Surface, as specified
 2. Concealed, as specified
- H. Products:
1. 9000 Heavy Duty
 2. 4000 Medium Duty
 3. 1000 Series Heavy Duty

2.16 DOOR PULLS AND PUSH PLATES

- A. Manufacturers:
1. Trimco (TR)
 2. Baldwin
 3. Burns
- B. Properties:
1. Pull Type: Straight, unless otherwise indicated.
 2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 1. Edges: Beveled, unless otherwise indicated.
- C. Grades: Comply with BHMA A156.6.
- D. Material: Stainless steel, unless otherwise indicated.

2.17 PROTECTION PLATES

- A. Manufacturers:
1. Trimco (TR)
 2. Baldwin
 3. Burns
- B. Properties:
1. Plates:
 1. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.
 2. 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.
 3. Mop Plates: Provide along bottom edge of pull side of doors to provide protection from cleaning liquids and equipment damage to door surface.
 4. 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

2.18 STOPS AND HOLDERS

- A. Manufacturers:
 1. Trimco (TR)
 2. Baldwin
 3. Burns
- 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.
 2. Floor Stops: Provide with bumper floor 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. Floor Stops.

2.19 ELECTROMAGNETIC DOOR HOLDERS

- A. Manufacturers:
 1. ABH (AB)
 2. Dormakaba
 3. Rixson
- B. Properties:
 1. Holding Force, Standard Duty: 40 lbs-force (177 N), minimum.
 2. Holding Force, Heavy Duty: 300 lbs-force (1334 N), minimum.
 3. Power Loss Status: Fail safe; door released to close.
 4. Life Safety Interface: With fire detectors, fire-alarm system, and smoke detectors for fire-resistance-rated door assemblies.
 5. Access Control Interface: With security system specified in Division 28.
- C. Grades: Comply with BHMA A156.15.
- D. Types: Wall mounted, single unit, standard duty, with strike plate attached to door.
- E. Options: As applicable to each item specified.
 1. Voltage: 12/24 VAC.
- F. Products:
 1. 2100 Series
 2. EM Series.

2.20 THRESHOLDS

- A. Manufacturers:
 1. National Guard Products (NA)
 2. Zero (ZE)
 3. Reese

- B. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.
 2. Exteriors: Seal perimeter to exclude water and vermin. Use butyl-rubber or polyisobutylene sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
 3. Fire-rated openings, 90 min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.
 4. Fire-rated openings, 3hour duration: Thresholds, where scheduled, to extend full jamb depth.
 5. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
- C. Grades: Thresholds: Comply with BHMA A156.21.
- D. Material: Base metal as indicated for each item by BHMA material and finish designation.
1. Threshold Assemblies: Aluminum.
- E. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.
1. Saddle Thresholds: Without thermal break.
 2. Half-Saddle Thresholds: Smooth flat top metal member installed flush with an offset.
 3. Interlocking Thresholds: Fluted-top metal member with integral single lip; designed to engage a hook strip applied to door.
 4. Bumper Seal Thresholds with Gasket: Use silicone gaskets.
 5. Plate Thresholds: Smooth flat top solid metal member.
 1. Include matching plate supports where indicated or required by project conditions.
 6. Ramped Thresholds: Modular, interlocking, sloped, fluted-top metal assemblies with closed return ends; 1:12 slope.
 7. Saddle Thresholds for Floor Closers: Type 1, for center-hung doors; ends not mitered.
 8. Stone thresholds: Solid stone material as required for water closet areas.

2.21 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
1. National Guard Products (NA)
 2. Zero (ZE)
 3. Reese
- B. Properties:
1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 2. Adhesive-Backed Perimeter Gasketing: Silicone gasket material applied to frame with self-adhesive.
 3. Rigid, Housed, Perimeter Gasketing: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with screws.
 4. Adjustable, Housed, Perimeter Gasketing, Screw-Adjustable: Sponge silicone gasket material held in place by aluminum housing; fastened to frame stop with screws.
 5. Overlapping Astragals for Meeting Stiles: Neoprene strip gasket material held in place by aluminum housing and overlapping when doors are closed; mounted to face of meeting stile with screws; surface mounted to door.

6. Meeting Astragals for Meeting Stiles: Silicone bulb gasket material held in place by aluminum housing; mounted with screws.
 1. Mounting: Surface mounted on face of each door.
 7. Spring Adjustable Astragals for Meeting Stiles: Screw-adjustable silicone gasket material held in place by aluminum housing; mounted with screws.
 1. Mounting: Surface mounted on face of each door.
 8. Door Sweeps: Neoprene gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.
 9. Door Shoes: Thermoplastic elastomer gasket material held in place by metal retainer; mounted to bottom edge of door with screws.
 1. Mounting: Surface mounted on bottom edge of door.
 2. Extended Housing: One side of door.
 10. Automatic Door Bottoms: Sponge neoprene gasket material held in place by aluminum housing that automatically drops to form seal when door is closed.
 1. Mounting: Surface mounted with screws on bottom edge of door.
 11. FEMA: Provide FEMA rated products as required.
- C. Grades: Comply with BHMA A156.22.
- D. Products:
1. Weatherstripping: See Door Hardware Schedule.
 2. Smoke Seals: See Door Hardware Schedule.
 3. Sound Seals: See Door Hardware Schedule.
 4. Meeting Stile Seals: See Door Hardware Schedule.
 5. Door Bottom Seals:
 1. Door Sweeps: See Door Hardware Schedule.
 2. Door Bottoms: See Door Hardware Schedule.
 3. Door Shoes: See Door Hardware Schedule.
 4. Automatic Door Bottoms: See Door Hardware Schedule.

2.22 MISCELLANEOUS ITEMS

- A. Manufacturers:
1. Trimco (TR)
 2. Baldwin
 3. Burns
- B. Properties:
1. Coat Hooks: Provide on room side of door, screw fastened.
 1. Material: Brass.
 2. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 1. Single Door: Provide three on strike jamb of frame.
 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 3. Material: Rubber, gray color.
- C. Products:
1. Coat Hooks.
 2. Silencers.

2.23 ELECTRIFIED HARDWARE

- A. Manufacturers:
1. BEST (BE)
 2. RCI
- B. Properties:
1. Power Supply Units: Manufacturer's standard.

1. Enclosures: Lockable NEMA Type 1, with hinged cover and knockouts.
 2. Power: 24 VCS, 6 Amp surge for 0.5 seconds; field-selectable.
 3. Emergency Release Terminals: Designed to release devices upon activation of fire alarm system.
 4. Auxiliary contacts for remote signaling.
 5. User-selectable time delay from 0 to 4 minutes.
 6. Fire Alarm System Interface: Standard.
 2. Wire Harnesses: Of sufficient length, with quick connectors.
 1. Wire Harness End Connection to Power Supply or Junction Box: One end with bare leads.
 3. Push Button Switches: Interior devices to initiate door opening.
- C. Products:
1. Power Supplies:
 1. ELR150 Series
 2. Wire Harnesses:
 1. BEST wire harnesses.

2.24 KEYS AND CORES

- A. Manufacturers:
1. BEST (BE)
 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.
 6. Include construction keying and control keying with removable core cylinders.
 7. For estimate, supply keys in following quantities:
 1. Master Keys: 4 each.
 2. Construction Master Keys: 6 each.
 3. Construction Keys: 15 each.
 4. Construction Control Keys: 2 each.
 5. Control Keys if New System: 2 each.
 8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
 9. Deliver keys as directed by Facility.
 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:
 1. CORMAX.

2.25 KEY CONTROL SYSTEMS

- A. Manufacturers:
1. BEST
 2. Substitutions: Not permitted.

- B. Properties: Manufacturer's scalable system for keeping track of keys, users, and doors.
 - 1. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
 - 2. Password Policy for Logins: Configurable.
 - 3. User Interface: Tile icons and customizable dashboard.
 - 4. Importing and Appending Data: At any time.
 - 5. User Directory Synchronization: Active, reducing manual entry.
 - 6. Email Notifications: Configurable for keys and other items currently due back on a designated day, notifications when keys and items are issued, and notifications when keys and other items are returned.
 - 7. Global Search Functionality: Capable of listing cores and their location, building, and doors.
 - 8. Relational Database: Allowing cross-referencing of people to cores and keys, doors, and buildings they access.
 - 9. Reports: Customizable.
 - 10. Self-service Password retrieval functionality.
 - 11. Program Installation: Standalone.
 - 12. Software Access: Allowing authorized users secure access to the software from anywhere, provided user can access their organization's secure network.
 - 13. Minimum Installation Requirements: As indicated in manufacturer's written installation instructions.
- C. Products:
 - 1. Keystone Web.

2.26 FIRE DEPARTMENT LOCK-BOXES

- A. Manufacturers:
 - 1. Knox Company
- B. Properties:
 - 1. Heavy-duty, recessed, solid steel box with hinged door and interior gasket seal; single drill-resistant lock with dust covers and tamper alarm.
 - 2. Capacity: Holds 10 keys.
 - 3. Construction complying with UL 1037, UL 1610, and UL 437.
- C. Finishes: Manufacturer's standard coating.
 - 1. Color: Manufacturer's standard dark bronze.
- D. Material: Steel.
- E. Options: As applicable to each item specified.
 - 1. Tamper Alarm: Connect alarm to facility electronic security system.
- F. Products:
 - 1. Knox: Coordinate location with Architect. Provide submittal for review before fabrication or ordering.

2.27 FINISHES

- A. Identified in Hardware Sets.
- B. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 - 1. Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent 32D), 652; satin chromium plated over nickel, with steel base material (former US equivalent 26D), and 689; aluminum painted, with any base material (former US equivalent US28); BHMA A156.18.
 - 2. Exceptions:
 - 1. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.

2. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
3. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
4. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
5. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

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 and solid thresholds out of water closets 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.
- K. Hardware Installer shall coordinate with Security contractor to route cable to connect electrified locks, panic hardware, and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.
- L. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.
- B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

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.
- D. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

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 SETS

- A. See door schedule in drawings for hardware set assignments.
- B. The hardware sets represent the basis of design intent and direction of the owner and architect. They should not be considered a detailed hardware schedule. Detailed or omitted items not included in the following hardware set(s) should be scheduled and submitted with the appropriate additional hardware required for proper application and functionality.
- C. Manufacturer's Abbreviations:
 - 1. BE BEST
 - 2. PR Precision
 - 3. DM Dormakaba
 - 4. LC LCN
 - 5. TR Trimco
 - 6. AB ABH Manufacturing
 - 7. ZE Zero
 - 8. MA Markar
 - 9. NA National Guard Products
 - 10. RC RCI

Hardware Sets

Set #001

Doors: A101A

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #001

2	Continuous Hinge	HD2700A (2" thick doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	2101 LD SNB (6)	630	PR
1	Exit Device	2103 X 1703A CD SNB (2)	630	PR
2	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
3	SFIC	1CDX Series	626	BE
2	Closer	EHD9016 SDST TB	689	BE
1	Mullion Seal	5100N		NA
1	Meeting Edge Seal	5070 (as required)		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
2	Position Switch	By Security Provider	BLK	RC
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Verify hardware as required for door type and material.
 NOTE: Provide thru bolts for closers for both 1-3/4" and 2" thick doors.
 NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #002

Doors: A101B

1	Continuous Hinge	HD2700A x EPT (2" Thick Doors)		NA
1	Continuous Hinge	HD2700A (2" thick doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	TSLs 2101 CD SNB (6)	630	PR
1	Exit Device	MLRTSLs2103 X 1703A CD SNB (2)	630	PR
2	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
3	SFIC	1CDX Series	626	BE
1	Automatic Operator	ED100LE (In-active Leaf)	CL	DM
1	Closer	EHD9016 SDST TB	689	BE
1	Mullion Seal	5100N		NA
1	Meeting Edge Seal	5070 (as required)		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
2	Touchless Actuator	910TC	BLK	RC
1	Power Supply	RPSMLR2		
1	Power Transfer	EPT-12C	630	PR
2	Position Switch	By Security Provider	BLK	RC
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #003

Doors: A179A

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #003

2	Continuous Hinge	HD2700A x EPT (2" Thick Doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	TSLs 2101 LD SNB (6)	630	PR
1	Exit Device	MLRTSLs 2103 X 1703A CD SNB (2)	630	PR
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Rim Cylinder	12E-72 L/C	626	BE
3	SFIC	1CDX Series	626	BE
2	Closer	EHD9016 SDST TB	689	BE
2	Custom Hole Spacer	4040XP-201-ST1944		LC
1	Mullion Seal	5100N		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
1	Meeting Edge Seal	5070 (as required)		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
1	Power Supply	RPSMLR2		PR
2	Power Transfer	EPT-12C	630	PR
2	Position Switch	By Security Provider	BLK	RC
1	Remote Switch	By Security Provider		
1	Card Reader	By Security Provider		
1	Junction Box	By Security Provider		
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Card reader to retract active door latch for authorized access.

NOTE: Provide remote switch at reception desk for monitored access.

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #004

Doors: A103A

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #004

2	Continuous Hinge	HD2700A x EPT (2" Thick Doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	TSLs 2101 CD SNB (6)	630	PR
1	Exit Device	MLR TSLs 2103 X 1703A CD SNB (2)	630	PR
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Rim Cylinder	12E-72 L/C	626	BE
3	SFIC	1CDX Series	626	BE
1	Automatic Operator	ED100LE (In-active Leaf)	CL	DM
1	Closer	EHD9016 SDST TB	689	BE
1	Custom Hole Spacer	4040XP-201-ST1944		LC
1	Mullion Seal	5100N		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
1	Meeting Edge Seal	5070 (as required)		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
2	Touchless Actuator	910TC	BLK	RC
1	Power Supply	RPSMLR2		PR
2	Power Transfer	EPT-12C	630	PR
2	Position Switch	By Security Provider	BLK	RC
1	Remote Switch	By Security Provider		
1	Card Reader	By Security Provider		
1	Junction Box	By Security Provider		
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Card reader to retract active door latch for authorized access.
NOTE: Provide remote switch at reception desk for monitored access.
NOTE: Retracting or dogging in-active door latch triggers LS switch enabling exterior actuator.
NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #005

Doors: A134A, B118, C118A, D108, E110, F107B, G101B, H101B

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #005

2	Continuous Hinge	HD2700A x EPT (2" Thick Doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	TSL5 2101 LD SNB (6)	630	PR
1	Exit Device	MLRTSL5 2103 X 1703A CD SNB (2)	630	PR
2	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
3	SFIC	1CDX Series	626	BE
2	Closer	EHD9016 SDS90 TB	689	BE
1	Mullion Seal	5100N		NA
1	Meeting Edge Seal	5070 (as required)		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
1	Power Supply	RPSMLR2		PR
2	Power Transfer	EPT-12C	630	PR
2	Position Switch	By Security Provider	BLK	RC
1	Card Reader	By Security Provider		
1	Junction Box	By Security Provider		
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Card reader to retract active door latch for authorized access.

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #006

Doors: A134B, C118B, D123, E124, F101, G101A, H101A

2	Continuous Hinge	HD2700A (2" thick doors)		NA
1	Removable Mullion	KR822 MCS	689	PR
1	Storage Kit	KMCB822SK (as required)	689	PR
1	Exit Device	2101 LD SNB (6)	630	PR
1	Exit Device	2103 X 1703A CD SNB (2)	630	PR
2	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
3	SFIC	1CDX Series	626	BE
2	Closer	EHD9016 SDS90 TB	689	BE
1	Mullion Seal	5100N		NA
1	Meeting Edge Seal	5070 (as required)		NA
1	Perimeter Seal	700S @ Head & Jambs		NA
2	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
2	Position Switch	By Security Provider	BLK	RC
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #007

Doors: B101B, B121, B122B, C110B, C115A, C118C, F102B, F112B

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #007

1	Continuous Hinge	HD2700A (2" thick doors)		NA
1	Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1	Exit Device	2101 LD SNB (6)	630	PR
1	Closer	EHD9016 SDS90 TB	689	BE
1	Custom Hole Spacer	4040XP-201-ST1944		LC
1	Perimeter Seal	700S @ Head & Jambs		NA
1	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA
1	Position Switch	By Security Provider	BLK	RC
1	Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Coordinate additional requirements with Security and Electrical drawings.

NOTE: Provide continuous hinge for door thickness as required.

Set #008

Doors: B112, B113

3	Hinges	STS FBB199 NRP	32D	BE
1	Reinforcing Pivot	B1923	US2G	MA
1	Exit Device	2103 X 1703A LD SNB (2)	630	PR
1	Rim Cylinder	12E-72 L/C	626	BE
1	SFIC	1CDX Series	626	BE
1	Closer	EHD9016 SDST TB	689	BE
1	Gasketing	5020 @ Head & Jambs		NA
1	Door Bottom	200SA		NA
1	Threshold	Per Detail	AL	NA

Set #009

Doors: B114, B115A

3	Hinges	STS FBB199 NRP	32D	BE
1	Lockset	45H-7XR14H L/C	626	BE
1	SFIC	1CDX Series	626	BE
1	Latch Protector	ILP-212	SL	DJ
1	Closer	EHD9016 AF90 REG TB	689	BE
1	Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1	Wall Bumper	1270CXSV	626	TR
1	Gasketing	5020 @ Head & Jambs		NA
1	Door Bottom	15NA		NA
1	Threshold	Per Detail	AL	NA

Set #010

Doors: B119B

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #010

6 Hinges	STS FBB199 NRP	32D	BE
1 Removable Mullion	KR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	2101 LD SNB (6)	630	PR
1 Exit Device	2103 X 1703A LD SNB (2)	630	PR
2 Rim Cylinder	12E-72 L/C	626	BE
2 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDS90 TB	689	BE
1 Mullion Seal	5100N		NA
1 Meeting Edge Seal	5070 (as required)		NA
1 Perimeter Seal	700S @ Head & Jambs		NA
2 Door Bottom	200SA		NA
1 Threshold	Per Detail	AL	NA
2 Position Switch	By Security Provider	BLK	RC
1 Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #011

Doors: FH01A, FH06A

3 Hinges	STS FBB191 NRP	32D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Latch Protector	ILP-212	SL	DJ
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Door Stop	1215CKU or 1270CXSV (as required)	626	TR
1 Door Bottom	15NA		NA
1 Threshold	Per Detail	AL	NA

Set #012

Doors: FH02, FH03, FH04, FH05

3 Hinges	STS FBB199 NRP	32D	BE
1 Deadlock	48H-7R L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Push Plate	1802-25CC-PH	630	TR
1 Pull Plate	1802-25CC-PL	630	TR
1 Closer	EHD9016 T90	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Door Stop	1215CKU or 1270CXSV (as required)	626	TR
3 Silencer	1229 Series	GRY	TR
1 Threshold	Per Detail	AL	NA

Set #013

Doors: MP01, MP02A, MP02B, MP03, MP04

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #013

3 Hinges	STS FBB191 NRP	32D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #100

Doors: A102A, A119, A125, A127, A139, B017

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #101 - Overhead

Doors: A102B, B103, B106A, B115B, FH01B, FH06B

NOTE: All hardware provided by door manufacturer.

Set #102

Doors: A103B, A179B

2 Continuous Hinge	HD2700A x EPT (2" Thick Doors)		NA
1 Removable Mullion	KR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	TSL5 2101 LD SNB (6)	630	PR
1 Exit Device	MLRTSLS 2103 X 1703A CD SNB (2)	630	PR
2 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDST TB	689	BE
1 Weatherstrip	By Door Mfr.		
1 Mullion Seal	5100N		NA
1 Threshold	Per Detail	AL	NA
1 Power Supply	RPSMLR2		PR
2 Power Transfer	EPT-12C	630	PR
2 Position Switch	By Security Provider	BLK	RC
1 Remote Switch	By Security Provider		
1 Card Reader	By Security Provider		
1 Junction Box	By Security Provider		
1 Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Card reader to retract active door latch for authorized access.

NOTE: Provide remote switch at reception desk for monitored access.

NOTE: Coordinate additional requirements with Security and Electrical drawings.

Set #103

Doors: A104A, A104B, A126B, A154, A175A, A175B

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #103

3 Hinge	FBB179 NRP	26D	BE
1 Office Lockset	45H-7AT15H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #104

Doors: A105, A108, A109, A117, A120, A122, A123, A128, A129, A130, A131, A156, A157, A158, A159, A160, A161, A164, A165, A170, A171, A172, C216, F114, F115

3 Hinge	FBB179 NRP	26D	BE
1 Office Lockset	45H-7AT15H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #105

Doors: A106, A174

3 Hinge	FBB179 NRP	26D	BE
1 Office Lockset	45H-7AT15H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Auto Door Bottom	423N or 320S (as required)		NA
1 Threshold	Per Detail	AL	NA

NOTE: Coordinate door undercut with auto door bottom and threshold.

Set #106

Doors: A107, A173

3 Hinge	FBB179 NRP	26D	BE
1 Privacy Indicator Lock	45H-7T14H L/C VIB	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 DST90 TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Marble Threshold	Per Detail		

Set #107

Doors: A110, A111, A168, A169, B109, C114, C224, C225

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #107

3 Hinge	FBB179 NRP	26D	BE
1 Privacy Indicator Lock	45H-7T14H L/C VIB	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Marble Threshold	Per Detail		

Set #108

Doors: A112, A155, A163, A167, A203, C105, C123, C213, C219, F109, F119

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #109

Doors: A113, A124, A162A, D126, D226, E128, F207, G219, H125, H204

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Door Stop	1215CKU or 1270CXSV (as required)	626	TR
3 Silencer	1229 Series	GRY	TR

Set #110

Doors: A126A

3 Hinge	FBB179 NRP	26D	BE
1 Entry Lockset	45H-7A14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA

Set #111

Doors: A132, C215

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 Closer	EHD9016 AF90P	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #112

Doors: A135, A136

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C TAC/O	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA

Set #113

Doors: A142A, A142B

2 Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1 Removable Mullion	KR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	2101 LD SNB (6)	630	PR
1 Exit Device	2103 X 1703A CD SNB (2)	630	PR
2 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SPA90 TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	2525 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #114

Doors: A142C, A142D

2 Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1 Removable Mullion	FLKR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	FL 2101 SNB (6)	630	PR
2 Exit Device	FL 2110VI X 4908D SNB (2)	630	PR
3 Rim Cylinder	12E-72 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDS90 TB	689	BE
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	2525 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #115

Doors: A144, A148

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #115

3 Hinges	STS FBB199 NRP	32D	BE
1 Push Plate	1802-25-PH	630	TR
1 Pull Plate	1802-25-PL	630	TR
1 Closer	EHD9016 SDST TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
3 Silencer	1229 Series	GRY	TR

Set #116

Doors: A145, A147

3 Hinges	STS FBB191 NRP	32D	BE
1 Office Lockset	45H-7AT15H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #117

Doors: B119A, D111, D112, D211, D219, E120, E121, E220, E221, G108, G124, G206, G218, H108, H129, H215, H216

3 Hinge	FBB179 NRP	26D	BE
1 Lockset	45H-7XR14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5050 @ Head & Jambs		NA
1 Bumper Seal Threshold	950S	AL	NA

NOTE: Coordinate door undercut with bumper seal threshold.

Set #118

Doors: A150

6 Hinge	FBB179 NRP	26D	BE
1 Semi-Auto Flushbolt	3825L X 3815L	626	TR
1 Dust Proof Strike	3910 or 3910N (as required)	630	TR
1 Lockset	45H-7XR14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
2 Silencer	1229 Series	GRY	TR

NOTE: Closer on active door only.

Set #119

Doors: A151

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #119

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5050 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #120

Doors: A162B

3 Hinge	FBB179 NRP	26D	BE
1 Passage Set	45H-0N14H	626	BE
1 Closer	EHD9016 DST90 TB	689	BE
3 Silencer	1229 Series	GRY	TR

Set #121

Doors: A180

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SPA90 TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #122

Doors: A181, C109, F103

6 Hinge	FBB179 NRP	26D	BE
1 Semi-Auto Flushbolt	3825L X 3815L	626	TR
1 Dust Proof Strike	3910 or 3910N (as required)	630	TR
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR

Set #123

Doors: A201A, A210B, F112A

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #123

6 Hinge	FBB168 NRP	26D	BE
1 Removable Mullion	KR822 MCS	689	PR
1 Exit Device	2101 LD SNB (6)	630	PR
1 Exit Device	2103 X 1703A CD SNB (2)	630	PR
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Rim Cylinder	12E-72 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	2525 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #124

Doors: A202A, A202B

3 Hinge	FBB179 NRP	26D	BE
2 Door Pull	1195-3 G	630	TR
1 Closer	EHD9016 DST90 TB	689	BE
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #125

Doors: A204, A205, A206, A207

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
2 SFIC	1CDX Series	626	BE
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #126

Doors: A210, C119, C209, D120, E125, E229, F205, G125, G217, H126, H217

6 Hinge	FBB179 NRP	26D	BE
1 Coordinator	3090 Series x FB	Silver	TR
1 Automatic Flush Bolt	3810 X 3810	626	TR
1 Lockset	45H-7XR14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 AF90 REG TB	689	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Meeting Edge Seal	5070 (as required)		NA
1 Gasketing	5020 @ Head & Jambs		NA
1 Bumper Seal Threshold	950S	AL	NA

NOTE: Coordinate door undercut with flush bolt and bumper seal threshold

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #127

Doors: B101A, B117A

6 Hinge	FBB168 NRP	26D	BE
1 Removable Mullion	FLKR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	FL 2101 SNB (6)	630	PR
1 Exit Device	FL 2110VI X 4908D SNB (2)	630	PR
3 Rim Cylinder	12E-72 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SPA90 TB	689	BE
2 Magnetic Door Holder	2100	US32D	AB
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA
1 Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Provide frame flush with exterior wall for 180-degree door swing.

NOTE: Integrate magnetic holders into fire alarm.

Set #128

Doors: B102A, B102C, B105A, B105C

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
2 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #129

Doors: B102B, B105B

6 Hinge	FBB179 NRP	26D	BE
1 Semi-Auto Flushbolt	3825L X 3815L	626	TR
1 Dust Proof Strike	3910 or 3910N (as required)	630	TR
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
2 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
2 Silencer	1229 Series	GRY	TR

Set #130

Doors: B108, D104, D110A, D110B, D204, D210A, D210B, E104, E108A, E108B, E204, E208A, E208B, F110, F203

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #130

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #131

Doors: B111

3 Hinge	FBB179 NRP	26D	BE
1 Office Lockset	45H-7AT15H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
3 Silencer	1229 Series	GRY	TR

Set #132

Doors: B115C, B116B

6 Hinge	FBB179 NRP	26D	BE
1 Semi-Auto Flushbolt	3825L X 3815L	626	TR
1 Dust Proof Strike	3910 or 3910N (as required)	630	TR
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
2 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
2 Silencer	1229 Series	GRY	TR

NOTE: Closer on active door only.

Set #133

Doors: B116A

6 Hinge	FBB179 NRP	26D	BE
1 Semi-Auto Flushbolt	3825L X 3815L	626	TR
1 Dust Proof Strike	3910 or 3910N (as required)	630	TR
1 Passage Set	45H-0N14H	626	BE
1 Overhead Holder	9010 Series	US26D	AB
1 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
2 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
2 Silencer	1229 Series	GRY	TR

Set #134

Doors: B117B

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #134

3 Hinge	FBB168 NRP	26D	BE
1 Exit Device	2103 X 4903D LD	630	PR
1 Rim Cylinder	12E-72 L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
3 Silencer	1229 Series	GRY	TR

Set #135

Doors: B117C

3 Hinge	FBB168 NRP	26D	BE
1 Exit Device	2110VI X 4908D LD	630	PR
2 Rim Cylinder	12E-72 L/C	626	BE
2 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
3 Silencer	1229 Series	GRY	TR

Set #136

Doors: B122A, C110A, C115B, C202A, C202B, C203A, C203B, C204A, C204B

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Door Shoe	36EV		NA
1 Threshold	Per Detail	AL	NA

NOTE: Coordinate door undercut with door shoe and threshold.

Set #137

Doors: B123

3 Hinge	FBB179 NRP	26D	BE
1 Storeroom Lockset	45H-7D14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Overhead Holder	4410 Series	US26D	AB
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Auto Door Bottom	423N or 320S (as required)		NA
1 Threshold	Per Detail	AL	NA

Set #138

Doors: B124A, B124B, C118, C208, F204

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #138

6 Hinge	FBB168 NRP	26D	BE
1 Exit Device	FL 2701 LBR SNB (6)	630	PR
1 Exit Device	FL 2714 X 4914D LBR SNB (2)	630	PR
2 Closer	EHD9016 SPA90 TB	689	BE
2 Magnetic Door Holder	2100	US32D	AB
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	5020 @ Head & Jambs		NA
1 Wiring & Riser Diagrams	Coordinate w/ Related Trades		

NOTE: Integrate magnetic holders into fire alarm.

Set #139

Doors: B142, B144, C102, C104, C107, C120, C121, C124, C210, C212, C217, C220, C222, D101, D102, D107, D109, D113, D114, D115, D118, D119, D121, D122, D124, D125, D201, D202, D207, D209A, D209B, D212, D213, D214, D217, D218, D222, D223, D224, D225, E101, E102, E107, E109, E111, E112, E113, E116, E117, E118, E119, E122, E123, E126, E127, E129, E201, E202, E207, E209, E211, E212, E213, E216, E217, E218, E219, E223, E224, E225, E226, E228, F104, F206, G201, G202, G203, G204, G205, G207, G209, G212, G213, G214, G215, G220, G221, H103, H104, H109, H112, H114, H117, H118, H121, H123, H128, H130, H132, H201, H202, H203, H205(2), H206(2), H208, H218, H219, H220, H222, H223, H224, H225

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Door Stop	1215CKU or 1270CXSV (as required)	626	TR
3 Silencer	1229 Series	GRY	TR

Set #140

Doors: C103, C106, C122, C125, C211, C218, C221, E230, G126, G216, H113, H210

2 Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1 Exit Device	2701 LBR LD	630	PR
1 Exit Device	2703 X 1703A CD LBR	630	PR
1 Rim Cylinder	12E-72 L/C	626	BE
1 Mortise Cylinder	1E-74 L/C	626	BE
2 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDST TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
2 Kick Plate	K0050 10" x 1" LDW x CSK B4E	630	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Meeting Edge Seal	5070 (as required)		NA

NOTE: Doors normally held-open and cylinder dogged unlocked.

Set #141

Doors: C108, F106A

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #141

6 Hinge	FBB168 NRP	26D	BE
1 Removable Mullion	KR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	2101 LD SNB (6)	630	PR
1 Exit Device	2110VI X 4908D LD	630	PR
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Rim Cylinder	12E-72 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Meeting Stile Astragal	555AA (set)		ZE
1 Mullion Seal	5100N		NA
1 Gasketing	5020 @ Head & Jambs		NA
1 Perimeter Seal	870AA @ Jambs Only		ZE
2 Auto Door Bottom	423N or 320S (as required)		NA
1 Threshold	Per Detail	AL	NA

Set #142

Doors: C112A, C112B, C113A, C113B

3 Hinge	FBB179 NRP	26D	BE
1 Passage Set	45H-0N14H	626	BE
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Dome Stop	1211	626	TR
3 Silencer	1229 Series	GRY	TR

Set #143

Doors: C207, F117, F118

3 Hinge	FBB179 NRP	26D	BE
1 Hotel Lockset	45H-7H14H STD (Option w/ separate key)	626	BE
1 Dormitory Lockset	45H-7TD14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Marble Threshold	Per Detail		

NOTE: Privacy can be interrupted with key unless optional Hotel lockset with separate Standard keying.

Set #144

Doors: D105, D106, D205, D206, E105, E106, E205, E206, F202, G222

PENDER COUNTY SCHOOLS K-8 SCHOOL
 PENDER COUNTY, NC
 Architect's Project No: 631310

Set #144

3 Hinges	STS FBB199 NRP	32D	BE
1 Push Plate	1802-25-PH	630	TR
1 Pull Plate	1802-25-PL	630	TR
1 Closer	EHD9016 SDST TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
3 Silencer	1229 Series	GRY	TR
1 Marble Threshold	Per Detail		

Set #145

Doors: F102A

6 Hinge	FBB168 NRP	26D	BE
1 Removable Mullion	KR822 MCS	689	PR
1 Storage Kit	KMCB822SK (as required)	689	PR
1 Exit Device	2101 LD SNB (6)	630	PR
1 Exit Device	2103 X 1703A CD SNB (2)	630	PR
1 Mortise Cylinder	1E-74 L/C	626	BE
2 Rim Cylinder	12E-72 L/C	626	BE
3 SFIC	1CDX Series	626	BE
2 Closer	EHD9016 SDST TB	689	BE
2 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mullion Seal	5100N		NA
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #146

Doors: F105A, F105B, F106B

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 SDST TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Perimeter Seal	870AA @ Jambs Only		ZE
1 Gasketing	5020 @ Head & Jambs		NA
1 Auto Door Bottom	423N or 320S (as required)		NA
1 Threshold	Per Detail	AL	NA

Set #147 - Double Egress

Doors: F108A

2 Wide Throw Hinge	Custom (verify)		NA
2 Exit Device	FL 2701 LBR SNB (6)	630	PR
2 Magnetic Door Holder	2100	US32D	AB
2 Closer	Special Template (verify)	689	BE
1 Gasketing	5020 @ Head & Jambs		NA
1 Wiring & Riser Diagrams	Coordinate w/ Related Trades		

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #147 - Double Egress

NOTE: Frame to be installed such that the south swinging leaf shall swing 180 degrees.
NOTE: Custom wide throw hinge required for 180-degree swing in double egress frame.
NOTE: Provide closer that will open 180 degrees on a double egress frame.
NOTE: Integrate magnetic holders into fire alarm.

Set #148

Doors: A146, F111

3 Hinge	FBB179 NRP	26D	BE
1 Lockset	45H-7XR14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Bumper Seal Threshold	950S	AL	NA

Set #149

Doors: F113B

3 Hinge	FBB179 NRP	26D	BE
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA

Set #150

Doors: F208

3 Hinge	FBB179 NRP	26D	BE
1 Lockset	45H-7XR14H L/C	626	BE
1 SFIC	1CDX Series	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Wall Bumper	1270CXSV	626	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Threshold	Per Detail	AL	NA

Set #151

Doors: G103, G105, G107, G110, G113, G116, G117, G120, G122, G127, G130

1 Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1 Intruder Indicator Lock	45H-7INL14H L/C VIN	626	BE
1 SFIC	1CDX Series	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Door Stop	1215CKU or 1270CXSV (as required)	626	TR
3 Silencer	1229 Series	GRY	TR

Set #152

Doors: G104, G106, G109, G114, G115, G118A, G118B, G121, G128, G129

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Set #152

1 Continuous Hinge	HD1400A (1-3/4" thick doors)		NA
1 Passage Set	45H-0N14H	626	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Dome Stop	1211	626	TR
1 Gasketing	2525 @ Head & Jambs		NA
1 Marble Threshold	Per Detail		

Set #153 - Pocket Door

Doors: G119

NOTE: All hardware provided by door supplier.

Set #154

Doors: H110, H111, H115, H116, H119, H120, H124, H127

3 Hinge	FBB179 NRP	26D	BE
1 Privacy Indicator Latch	45H-0L14H VIB	626	BE
1 Closer	EHD9016 AF90 REG TB	689	BE
1 Kick Plate	K0050 10" x 2" LDW x CSK B4E	630	TR
1 Mop Plate	KM050 6" x 1" LDW x CSK B4E	630	TR
1 Gasketing	5020 @ Head & Jambs		NA
1 Marble Threshold	Per Detail		

END OF SECTION

Opening List
(Delete prior to publication)

Opening	Hdw Set	Opening Label	Door Type	Frame Type
A105	104			
A106	105			
A107	106			
A108	104			
A109	104			
A110	107			
A111	107			
A112	108			
A113	109			
A117	104			
A119	100			
A120	104			
A122	104			
A123	104			
A124	109			
A125	100			
A127	100			
A128	104			
A129	104			
A130	104			
A131	104			
A132	111	Rated		
A135	112	Rated		
A136	112	Rated		
A139	100			
A144	115			
A145	116			
A146	148			
A147	116			
A148	115			
A150	118			
A151	119	Rated		
A154	103			
A155	108			
A156	104			
A157	104			
A158	104			
A159	104			
A160	104			
A161	104			
A163	108			
A164	104			
A165	104			
A167	108			
A168	107			
A169	107			
A170	104			
A171	104			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
A172	104			
A173	106			
A174	105			
A180	121	Rated		
A181	122			
A203	108			
A204	125			
A205	125			
A206	125			
A207	125			
A210	126			
B017	100			
B103	101			
B108	130			
B109	107			
B111	131			
B112	008			
B113	008			
B114	009			
B118	005		FRP	
B121	007		FRP	
B123	137			
B142	139			
B144	139			
C102	139			
C103	140			
C104	139			
C105	108			
C106	140			
C107	139			
C108	141			
C109	122			
C114	107			
C118	138	Rated		
C119	126			
C120	139			
C121	139			
C122	140			
C123	108			
C124	139			
C125	140			
C207	143			
C208	138	Rated		
C209	126			
C210	139			
C211	140			
C212	139			
C213	108			
C215	111			
C216	104			
C217	139			
C218	140			
C219	108			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
C220	139			
C221	140			
C222	139			
C224	107			
C225	107			
D101	139			
D102	139			
D104	130			
D105	144			
D106	144			
D107	139			
D108	005		FRP	
D109	139			
D111	117			
D112	117			
D113	139			
D114	139			
D115	139			
D118	139			
D119	139			
D120	126			
D121	139			
D122	139			
D123	006		FRP	
D124	139			
D125	139			
D126	109			
D201	139			
D202	139			
D204	130			
D205	144			
D206	144			
D207	139			
D211	117			
D212	139			
D213	139			
D214	139			
D217	139			
D218	139			
D219	117			
D222	139			
D223	139			
D224	139			
D225	139			
D226	109			
E101	139			
E102	139			
E104	130			
E105	144			
E106	144			
E107	139			
E109	139			
E110	005		FRP	

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
E111	139			
E112	139			
E113	139			
E116	139			
E117	139			
E118	139			
E119	139			
E120	117			
E121	117			
E122	139			
E123	139			
E124	006		FRP	
E125	126			
E126	139			
E127	139			
E128	109			
E129	139			
E201	139			
E202	139			
E204	130			
E205	144			
E206	144			
E207	139			
E209	139			
E211	139			
E212	139			
E213	139			
E216	139			
E217	139			
E218	139			
E219	139			
E220	117			
E221	117			
E223	139			
E224	139			
E225	139			
E226	139			
E228	139			
E229	126			
E230	140			
F101	006		FRP	
F103	122			
F104	139			
F109	108			
F110	130			
F111	148	Rated		
F114	104			
F115	104			
F117	143			
F118	143			
F119	108			
F202	144			
F203	130			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
F204	138	Rated		
F205	126			
F206	139			
F207	109			
F208	150	Rated		
FH02	012			
FH03	012			
FH04	012			
FH05	012			
G103	151			
G104	152			
G105	151			
G106	152			
G107	151			
G108	117			
G109	152			
G110	151			
G113	151			
G114	152			
G115	152			
G116	151			
G117	151			
G119	153			
G120	151			
G121	152			
G122	151			
G124	117			
G125	126			
G126	140			
G127	151			
G128	152			
G129	152			
G130	151			
G201	139			
G202	139			
G203	139			
G204	139			
G205	139			
G206	117			
G207	139			
G209	139			
G212	139			
G213	139			
G214	139			
G215	139			
G216	140			
G217	126			
G218	117			
G219	109			
G220	139			
G221	139			
G222	144			
H103	139			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
H104	139			
H108	117			
H109	139			
H110	154			
H111	154			
H112	139			
H113	140			
H114	139			
H115	154			
H116	154			
H117	139			
H118	139			
H119	154			
H120	154			
H121	139			
H123	139			
H124	154			
H125	109			
H126	126			
H127	154			
H128	139			
H129	117			
H130	139			
H132	139			
H201	139			
H202	139			
H203	139			
H204	109			
H205	139			
H206	139			
H208	139			
H210	140			
H215	117			
H216	117			
H217	126			
H218	139			
H219	139			
H220	139			
H222	139			
H223	139			
H224	139			
H225	139			
MP01	013	Rated		
MP03	013			
MP04	013			
A101A	001		FRP	
A101B	002		FRP	
A102A	100			
A102B	101			
A103A	004		FRP	
A103B	102			
A104A	103			
A104B	103			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
A126A	110			
A126B	103			
A134A	005		FRP	
A134B	006		FRP	
A142A	113			
A142B	113			
A142C	114	Rated		
A142D	114	Rated		
A162A	109			
A162B	120			
A175A	103			
A175B	103			
A179A	003		FRP	
A179B	102			
A201A	123			
A202A	124			
A202B	124			
A210B	123			
B101A	127	Rated		
B101B	007		FRP	
B102A	128			
B102B	129			
B102C	128			
B105A	128			
B105B	129			
B105C	128			
B106A	101			
B115A	009			
B115B	101			
B115C	132			
B116A	133			
B116B	132			
B117A	127	Rated		
B117B	134			
B117C	135			
B119A	117			
B119B	010			
B122A	136			
B122B	007		FRP	
B124A	138	Rated		
B124B	138	Rated		
C110A	136			
C110B	007		FRP	
C112A	142			
C112B	142			
C113A	142			
C113B	142			
C115A	007		FRP	
C115B	136			
C118A	005		FRP	
C118B	006		FRP	
C118C	007		FRP	
C202A	136			

Pender K8 School
000040175

Opening	Hdw Set	Opening Label	Door Type	Frame Type
C202B	136			
C203A	136			
C203B	136			
C204A	136			
C204B	136			
D110A	130			
D110B	130			
D209A	139			
D209B	139			
D210A	130			
D210B	130			
E108A	130			
E108B	130			
E208A	130			
E208B	130			
F102A	145			
F102B	007		FRP	
F105A	146			
F105B	146			
F106A	141			
F106B	146			
F107B	005		FRP	
F108A	147	Rated		
F112A	123			
F112B	007		FRP	
F113B	149	Rated		
FH01A	011			
FH01B	101			
FH06A	011			
FH06B	101			
G101A	006		FRP	
G101B	005		FRP	
G118A	152			
G118B	152			
H101A	006		FRP	
H101B	005		FRP	
MP02A	013			
MP02B	013			

**SECTION 088000
GLAZING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- K. GANA (GM) - GANA Glazing Manual.
- L. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- M. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.02 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.

1.03 SUBMITTALS

- A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Certificate: Certify that products of this section meet or exceed specified requirements.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and IGMA TM-3000 for glazing installation methods.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions. Deliver and store in a manner to prevent exposure to weather/moisture, direct sun/UV, and temperature changes.

1.06 FIELD CONDITIONS

- A. Ambient Conditions: Do not install glazing, gasketing, or liquid sealants under adverse weather conditions, or when temperatures are above or below manufacturer's recommended limitations for sealant installation.
 - 1. Do not install glazing when ambient temperature is less than 40 degrees F.
 - 2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries.
 - 2. Guardian Glass, LLC.
 - 3. Viracon.
 - 4. Vitro Architectural Glass (formerly PPG Glass).

2.02 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 and values indicated on Structural Drawings.
 - 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 complete assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and air barrier.

- 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.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Provide Type I, Quality-Q3, Class 1 (clear) glazing unless otherwise indicated.
 - a. Tinted Glazing: Where tinted glazing is indicated, provide Class 2 (tinted).
 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 5. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
 6. Spandrel Glass Type: ASTM C 1048, Type I, Condition - B, Quality - Q3, with performance characteristics matching those of adjacent non-spandrel units.
 7. Patterned Glass Type: ASTM C1048, Type II - Patterned Flat Glass, Quality - Q6, Form 3 - Patterned glass, with color and performance characteristics as indicated.
 - a. "Frosted" Appearance: Provide non-directional acid-etch or simulated acid-etch "frosted"/translucent finish on one or both faces of glass lite.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172. Laminated glass shall be free of foreign substances and air or glass pockets.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.
 2. Ionoplast Interlayer: 0.060 inch thick, minimum.
 - a. Provide Kuraray "SentryGlas" or comparable ionoplast interlayer submitted as a properly formatted substitution request.
 - b. Color: Clear.
 - c. Interlayer Physical Properties:
 - 1) Young's Modulus: 43 kpsi, when tested in accordance with ASTM D5026.
 - 2) Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
 - 3) Elongation: 400%, when tested in accordance with ASTM D638.
 - 4) Flex Modulus: 50 kpsi, when tested in accordance with ASTM D790.
 - 5) Heat Deflection Temperature at 0.46 MPa: 110 degrees F, when tested in accordance with ASTM D648.

2.04 INSULATING GLASS UNITS

- A. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- B. Insulating Glass Units: Types as indicated. IGU's shall be pre-assembled in factory of multiple lites, with dehydrated interspace.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Warm-Edge Spacers: Manufacturer's warm-edge technology design.
 - a. Spacer Width: As required for specified insulating glass unit.
 - b. Spacer Height: Manufacturer's standard.
 - c. Products:
 - 1) H.B. Fuller Construction Products Inc; Kodispace 4SG.
 - 2) Quanex IG Systems, Inc; Super Spacer TriSeal.
 - 3) Technoform Glass Insulation; TGI-Spacer.
 - 4) Substitutions: See Section 016000 - Product Requirements.
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.

2.05 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Continuous 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.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

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 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.

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 in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 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 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. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.06 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.

3.08 GLAZING SCHEDULE

- A. Type G-1 - Monolithic Interior Vision Glazing:
 - 1. Applications: Interior glazing unless otherwise indicated.
 - 2. Glass Type: Fully tempered float glass. Provide with safety glazing labeling.
 - 3. Tint: Clear.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

4. Thickness: 1/4 inch, nominal.
 5. Glazing Method: Dry glazing method, gasket glazing.
- B. Type G-2 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Gray.
 - b. Coating: Low-E (passive type), on #2 surface.
 - c. Coating Products (Low-E; Gray Tinted):
 - 1) Cardinal; ES 25 Pure Grey #2.
 - 2) Guardian; SN 68 Gray.
 - 3) Viracon; #VE3-2M.
 - 4) Vitro; Solarban 60 (2) Solargray.
 4. Warm-edge spacer.
 5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 6. Total Thickness: 1 inch.
 7. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.30, maximum.
 8. Solar Heat Gain Coefficient (SHGC): 0.25, maximum.
 9. Glazing Method: Dry glazing method, gasket glazing.
 10. Provide with safety glazing labeling.
- C. Type G-3 - Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior glazing where indicated.
 2. Space between lites filled with air.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 - c. Coating Products (Clear; Low-E):
 - 1) AGC; Energy Select 28.
 - 2) Cardinal; ES 28 #2.
 - 3) Guardian; SNX 62/27.
 - 4) Viracon; #VNE 1-63.
 - 5) Vitro; Solarban 70.
 4. Warm-edge spacer.
 5. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit, on #4 surface.
 - c. Opacifier Color: Selected by Architect from manufacturer's full range.
 6. Total Thickness: 1 inch.
 7. Thermal (U-Value and SHGC): Match requirements of vision units.
 8. Glazing Method: Dry glazing method, gasket glazing.
 9. Provide with safety glazing labeling.
- D. Type G-4 - Insulating Spandrel Unit (Metal Spandrel) - Refer to 084313 - Aluminum-Framed Storefronts for metal infill panels.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- E. Type G-5 - Monolithic Interior Spandrel Glazing.
 - 1. Applications: Interior glazing where indicated.
 - 2. Warm-edge spacer.
 - 3. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit; confirm interior (opaque) orientation prior to installation.
 - c. Opacifier Color: Selected by Architect from manufacturer's full range.
 - 4. Total Thickness: 1/4-inch.
 - 5. Glazing Method: Dry glazing method, gasket glazing.
 - 6. Provide with safety glazing labeling.
- F. Type G-6 - Insulating Glass Units With Light-Diffusing Translucent Core: Factory-assembled units consisting of sealed lites of glass with manufacturer's proprietary diffusing core material.
 - 1. Products: Provide Okalux+ by OKALUX North America, Solera S R5+Aerogel by Advanced Glazings Ltd, or a comparable product submitted via properly formatted substitution request.
 - 2. Applications: Exterior glazing where indicated.
 - 3. Outboard Lite: Fully tempered float glass, clear; 1/4 inch thick, minimum.
 - a. Coating: Low-E (passive type), on #2 surface.
 - 4. Translucent Core: 1/2-inch thick; material as standard with manufacturer: either diffusing cloth layers with capillary slab material, and with air space filled with argon gas, or a honeycomb capillary insulation filled with manufacturer's proprietary aerogel.
 - 5. Inboard Lite: Fully tempered float glass, clear; 1/4 inch thick, minimum.
 - 6. Total Thickness: 1 inch.
 - 7. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.24, maximum.
 - 8. Visible Light Transmittance (VLT): 31 percent, minimum.
 - 9. Solar Heat Gain Coefficient (SHGC): 0.29, maximum.
 - 10. Glazing Method: Dry glazing method, gasket glazing.
 - 11. Provide with safety glazing labeling.
- G. Type G-7 - Transparent One-Way Mirror: Mirror quality float glass with pyrolytic (hard coat) type coating located on high light level surface of glass; ASTM C1376.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Thickness: 1/4 inch.
 - 3. Glass Tint: Grey.
 - 4. Glass Type: Fully tempered.
 - 5. Lighting Ratio: Maintain at least 8:1 lighting level ratio between coated side (bright-observed side) and uncoated side (dim-observer side).
 - 6. Glazing Method: Gasket glazing.
- H. Type G-8 - Fire-Protection-Rated Glazing - Refer to Section 088813 - Fire-Rated Glazing.
- I. Type G-9 - Insulating Glass Units with Fire-Resistance Rated Glazing.
 - 1. Applications: Exterior glazing where indicated.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum; with Low-E coating on #2 surface; match outboard lite at Glazing Type G-2.
 - 4. Warm-edge spacer.
 - 5. Inboard Lite: Fire-resistance-rated lite; refer to Section 088813 - Fire-Rated Glazing.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

6. Total Thickness: 1 inch.
7. Thermal (U-Value and SHGC): Match requirements of vision units (Type G-2).
8. Glazing Method: Dry glazing method, gasket glazing.
9. Provide with safety glazing labeling.

END OF SECTION 088000

**SECTION 088300
MIRRORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C1036 - Standard Specification for Flat Glass.
- D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- E. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- F. GANA (GM) - GANA Glazing Manual.
- G. GANA (SM) - GANA Sealant Manual.
- H. SCAQMD 1168 - Adhesive and Sealant Applications.

1.02 SUBMITTALS

- A. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- C. Safety Mirror Certificate: Provide certification that mirrors with film backing used for this project are tested to and pass the requirements of safety glazing per ANSI Z97.1 and CPSC 16 16 CFR 1201, Category II.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods, including GANA's "Glazing Manual" and "Mirrors: Handle with Extreme Care."
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.
- C. Safety Glazing: Mirrors shall be certified as safety glazing per ANSI Z97.1 and CPSC 16 16 CFR 1201, Category II.

1.04 FIELD CONDITIONS

- A. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for deterioration of reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mirrors:
 - 1. Arch Aluminum and Glass Co., Inc.
 - 2. Binswanger Mirror/ACI Distribution.
 - 3. Gardner Glass Products.
 - 4. Gilded Mirrors, Inc.
 - 5. Guardian Industries Corp.
 - 6. Independent Mirror Industries, Inc.
 - 7. Lenoir Mirror Co.
 - 8. Messer Industries, Inc.
 - 9. Stroupe Mirror Co., Inc.
 - 10. Sunshine Mirror.
 - 11. Trulite Glass and Aluminum Solutions.
 - 12. Virginia Mirror Company, Inc.
 - 13. Walker Glass Company Ltd.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
 - 1. Thickness: 1/4 inch.
 - 2. Size: As indicated on drawings.

2.03 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- C. Glazing Clips: Manufacturer's standard type.
- D. Fasteners/Anchors: Provide manufacturer's recommended fasteners and anchors for indicated substrates.
 - 1. Where metal or wood stud substrate is indicated, coordinate with Division 6, Section 061000 - Rough Carpentry and Division 9, Section 092216 - Cold Formed Steel Framing - Non-Structural (CFSF-NS) to provide concealed blocking or reinforcing along full length of J-channel mounting locations to provide a solid substrate for fastening.
- E. Mirror Adhesive/Mastic: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
 - 1. Low-Emitting Material: Provide mastic that is tested and determined compliant in accordance with CAL (CDPH SM) AND that meets the chemical content requirements of SCAQMD 1168.

- F. Aluminum Channel Frame: Provide J-channel framing, fabricated from minimum 0.045-inch clear anodized aluminum extrusions. Size all channel framing for 1/4 inch nominal mirror thickness, in lengths sized to cover edges of each mirror section with one continuous piece.
1. Bottom Trim: J-channel with 3/8-inch exposure front leg, 3/4- or 7/8-inch rear leg.
Available Products:
 - a. Brunner Enterprises, Inc.; Mirror Lower "J" Channel.
 - b. C.R. Laurence Co., Inc.; CRL Standard "J" Channel.
 - c. Eagle Mouldings, Inc; Aluminum J-Cap - 3/8" Face for 1/4" Material.
 2. Top Trim: J-channel with 5/8-inch exposure front leg, 1- or 1-1/8-inch rear leg. Available Products:
 - a. Brunner Enterprises, Inc.; Mirror Upper "J" Channel.
 - b. C.R. Laurence Co., Inc.; CRL Deep "J" Channel.
 - c. Eagle Mouldings, Inc; Aluminum J-Cap - 5/8" Face for 1/4" Material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Install J-channel frame sections to the wall with mechanical fasteners. Install fasteners in a manner so that they do not cause point loads to impact the rear of mirror panels.
- C. Install mirrors with mirror mastic; provide mastic in coverage amount recommended by manufacturer, and in coverage pattern allowing for air circulation behind mirrors.
- D. Set mirrors plumb and level, and free of optical distortion.
- E. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

END OF SECTION 088300

**SECTION 088733
DECORATIVE FILMS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Record of product certification for safety requirements.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- B. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.
- C. Samples: For custom printed digital film product to be used, minimum size 8 inches by 10 inches, representing actual product, color, and pattern for approval.
- D. Specimen Warranty.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Certified by glazing film manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.05 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

- A. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. 3M Window Film.
- B. Flexvue Films.
- C. Llumar.
- D. Madico, Inc.

2.02 MATERIALS

- A. Glazing Film: Perforated cast vinyl film with custom printed graphic for bonding to glass.
 - 1. Basis of Design Product: 3M; Scotchcal 8710-50 Perforated Window Graphic Film.
-

2. Thickness: 4 mils, minimum.
 3. Color: Custom printed graphic matching Architect's sample.
 - a. Include a \$500 allowance for licensing and digital image formatting.
 - b. Digital image licensor shall provide a digital file formatted in accordance with window film manufacturer's digital requirements.
 - c. Coordinate Basis of Design image with Architect after bidding.
 4. Construction: Perforated with white on the image side and black on the reverse see-through side.
 5. Adhesive Type: Clear pressure sensitive acrylic.
 6. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
- B. Protective Overlay Film: Clear cast vinyl overlay film.
1. Basis of Design Product: 3M; Scotchcal 8914 Overlamine.
 2. Thickness: 2 mils, minimum.
 3. Color: Clear.
 4. Construction: Cast vinyl film.
 5. Adhesive Type: Laminated to graphic layer.
 6. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
- C. Accessory Materials: As recommended or required by film manufacturer.
- D. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.
- B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.
- C. Verify glass is not cracked, chipped, broken, or damaged.
- D. Verify that frames are securely anchored and free of defects.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
- B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
- C. Protect adjacent surfaces.
- D. Do not begin installation until substrates have been properly prepared.

3.03 INSTALLATION

- A. Do not apply glazing film when surface temperature is less than 40 degrees F or if precipitation is imminent.

- B. Install graphic layer then laminate protective layer in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.
 - 1. Protect graphic layer from scratches, smudging, or any form of physical contact until the protective layer is installed.
- C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.
- D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.
- E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.
- F. Remove labels and protective covers.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 088733

**SECTION 088813
FIRE-RATED GLAZING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- D. GANA (GM) - GANA Glazing Manual.
- E. ITS (DIR) - Directory of Listed Products.
- F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- G. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.
- H. UL (DIR) - Online Certifications Directory.
- I. UL 9 - Standard for Fire Tests of Window Assemblies.
- J. UL 10B - Standard for Fire Tests of Door Assemblies.
- K. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.03 SUBMITTALS

- A. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Certificate: Certify that products of this section meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with GANA (GM) for glazing installation methods.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.05 FIELD CONDITIONS

- A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer Warranty for Coated or Laminated Fire Glass: Provide five-year manufacturer warranty coverage for coating deterioration or delamination, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 3. Glass thicknesses listed are minimum.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind FT - Fully Tempered Type: Comply with ASTM C1048.
 2. Impact-Resistant Safety Glass: Comply with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

2.03 GLAZING UNITS

- A. Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period(s) as indicated on drawings.
1. Applications:
 - a. Vision lites in fire-rated door assemblies where size does not exceed 100 square inches.
 - b. Other locations as indicated on drawings.
 2. Glass Type: Safety ceramic glass.
 3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
 4. Safety Glazing Certification: 16 CFR 1201 Category II.
 5. Glazing Method: As required for fire rating.
 6. Fire-Rating Period: As indicated on drawings.
 7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
 - a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
 - d. "XXX" - placeholder that represents fire-rating period, in minutes.
 8. Products:

- a. SCHOTT North America Inc; PYRAN Platinum F (Surface-Applied Safety Film).
- b. Technical Glass Products; Firelite NT.
- c. Vetrotech North America; Keralite/Select Filmed.

2.04 ACCESSORIES

- A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Flexible tape made from spun calcium-magnesium-silica fibers in binder; designed to remain stable at temperatures up to 2,012 degrees F.
 - 1. Thickness: As recommended by framing manufacturer for glazing application.
- D. Glazing Gaskets: Flexible intumescent seals.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. 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.

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 in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from interior of building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.05 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 four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with '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 088813

**SECTION 089100
LOUVERS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AMCA 511 - Certified Ratings Program for Air Control Devices.

1.02 SUBMITTALS

- A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
- C. Samples: Manufacturer's color charts indicating full range of available colors.
- D. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified performance requirements.

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
 - 1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Louvers:
 - 1. Airline Louvers.
 - 2. Airolite Company, LLC.
 - 3. American Warming and Ventilating.
 - 4. Construction Specialties, Inc.
 - 5. Greenheck Fan Corporation.
 - 6. Industrial Louvers, Inc.
 - 7. NCA, a brand of Metal Industries Inc.
 - 8. Pottorff.
 - 9. Reliable Products, Inc.
 - 10. Ruskin.
 - 11. United Enertech.
 - 12. Substitutions: See Section 016000 - Product Requirements.

2.02 LOUVERS

- A. Louvers, General: All louvers shall be factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511; provide AMCA Certified seal/markings on all louvers.
- B. Storm-Resistance/Wind-Driven Rain Resistant Louvers: Vertical blade, extruded aluminum construction. Provide at all indicated louvers.
 - 1. Basis-of-Design Product: Greenheck; EVH-501.
 - 2. Free Area: 50 percent, minimum.
 - 3. Free Area Velocity at Point of Beginning Water Penetration (0.01 oz. / ft²): Minimum 1,250 fpm.
 - 4. Wind-Driven Rain Performance: AMCA certified Class A; 99 percent effectiveness when tested at a rainfall rate of 3.0 inches per hour, wind speed of 29 mph, and nominal core ventilation rate of 300 ft/min (1.5 m/s).
 - 5. Blades: Vertical, V-shaped, positioned on approximate 1.5 inches on center.
 - 6. Frame: 5 inches deep, channel profile; corner joints mitered, with continuous recessed caulking channel each side. Provide integrally draining head and sill components.
 - 7. Aluminum Thickness: Frame 0.080-inch minimum; blades 0.060-inch minimum.
 - 8. Aluminum Finish: Superior performing organic coatings; finish welded units after fabrication.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

- A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
- B. Color: To be selected by Architect from manufacturer's full range .

2.05 ACCESSORIES

- A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame. Provide insect screens at intake louvers and at non-ducted louvers, and provide bird screens at exhaust louvers
 - 1. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.
 - 2. Insect Screen: 18 x 16 size aluminum mesh.
- C. Fasteners: Concealed type; stainless steel. If exposed fasteners are unavoidable, provide color-matched heads to match framing color.
- D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION 089100

SECTION 092216
COLD FORMED STEEL FRAMING - NON-STRUCTURAL (CFSF-NS)

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Refer to Section 054000 - Cold-Formed Steel Framing - Structural (CFSF-S): Requirements for structural, load-bearing, metal stud framing and overhead/suspended/bulkhead framing.

1.02 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

1.03 SUBMITTALS

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Steel Thickness (Studs and Runners): Minimum 0.0179-inch (18 mil / 25 gauge) unless otherwise required to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf, and as indicated below:
 - a. Provide minimum 0.0329-inch thickness (33 mil / 20 gauge) for all partitions using 3-5/8-inch-deep studs where stud partition height is greater than 12 feet above floor level.
 - b. Provide minimum 0.0329-inch (33 mil / 20 gauge - Structural) for high-density board applications, such as ASTM C1178 tile backing panels and ASTM C1629 abuse- or impact-resistant gypsum board, and at door frames.
 - c. Provide minimum 0.0329-inch (33 mil / 20 gauge - Structural) for walls receiving heavy wall-hung items or loads, including but not limited to wall cabinets, wall-hung countertops, TV brackets, liquid tanks, folding and fixed seats, grab bars, handrails, exercise equipment, and shelving greater than 9 inches deep and over 3 feet in length.
 - 2. Studs: C-shaped with flat faces.
 - 3. Runners: U-shaped, sized to match studs.

4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- B. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
- C. Non-Loadbearing Framing Accessories:
 1. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 2. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; cold-rolled channel / hat-section profile; for lateral bracing of wall studs with slots for engaging on-module studs.
 3. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.
 4. Sheet Metal Backing: 0.036 inch thick flat strap/plate.
 5. Fasteners: Self-tapping screws designed for attachment of metal framing and recommended by manufacturer.
 6. Anchorage Devices: Powder actuated or screw anchors with sleeves, recommended by manufacturer for anchorage to indicated substrates.
 7. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced. Thickness as indicated, or sized to fit stud depth indicated.
 8. Acoustic Sealant: Refer to Division 07 Section "Joint Sealants."

2.02 GYPSUM BOARD SUSPENSION SYSTEM

- A. For interior overhead gypsum board, in lieu of separate stick built fixed-framing bulkheads and soffits fabricated of Structural Cold-Formed Steel Framing (CFSF-S), Contractor may provide a direct hung suspension system, per ASTM C645, composed of pre-fabricated beams and cross-furring members, specifically designed for use with gypsum board.
- B. Products:
 1. Armstrong; Quikstix Drywall Grid System.
 2. Certainteed; 1-1/2" Drywall Suspension System.
 3. Rockfon; Chicago Metallic Drywall Grid System.
 4. USG; Drywall Suspension System.

2.03 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Install in accordance with ASTM C754. Provide framing, including bracing, bridging, and anchorage accessories, to meet L/240 deflection limit at a lateral pressure of 5 psf unless indicated otherwise.

1. Gypsum Board: At gypsum board partitions and assemblies, comply with applicable requirements of ASTM C840 for framing installation.
- B. Extend partition framing to deck at locations indicated, and to a height 4 inches above ceiling level at all other locations, unless otherwise indicated.
- C. Partitions Terminating to Deck: Secure partitions to building structure in accordance with Structural Drawings. Do not fasten runner directly to floor/roof deck; provide clearance for firestopping. Coordinate with Section 078400 - Firestopping for head-of-wall joint firestopping assemblies and firestopping around structural elements as required.
- D. Partitions Terminating Above Ceiling: Attach studs to runner using specified mechanical devices in accordance with manufacturer's instructions. Brace runners to structural elements in accordance with Structural Drawings.
- E. Align and secure top and bottom runners at maximum 24 inches on center.
- F. At partitions indicated with an acoustic rating:
 1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Install studs vertically at 16 inches on center, unless otherwise indicated.
- I. Align stud web openings horizontally.
- J. Secure studs to tracks using crimping method. Do not weld.
- K. Fabricate corners using a minimum of three studs.
- L. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- M. Install bracing, bridging, and anchorage to brace stud framing system rigid.
- N. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- O. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- P. Blocking: Use FRT wood blocking or metal channel stud blocking, secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, opening frames, and other built-in-place wall mounted items and equipment.
- Q. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 GYPSUM BOARD SUSPENSION SYSTEM

- A. Install suspension system in accordance with manufacturer's instructions. Do not attach overhead suspension hangers to or suspend from steel floor or roof deck; fasten to primary structural beams/joists or provide intermediate slotted track as supplemental structure between primary structural elements.

3.04 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION 092216

**SECTION 092900
GYPSUM BOARD**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- I. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
- K. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- L. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.
- N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- O. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- P. GA-216 - Application and Finishing of Gypsum Panel Products.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Sequencing: Install service utilities in an orderly and expeditious manner.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Provide data on gypsum board, accessories, and joint finishing system.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

1.05 DELIVERY, STORAGE, HANDLING, AND FIELD CONDITIONS

- A. Do not deliver or install until building is weather-tight and conditioned.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.
- C. Do not install gypsum products that have gotten wet or moldy, or show signs of past moisture damage.
- D. Maintain uniform temperature and humidity at occupancy conditions during and after installation. Allow products to acclimatize prior to installation.

PART 2 PRODUCTS

2.01 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; with tapered edges.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever gypsum board is indicated in rooms subject to steam or water, including mechanical rooms, toilet rooms, custodial rooms, and kitchens.
 - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Curved Surfaces: Provide flexible 1/4 inch thickness gypsum board, installed in two layers.
 - 5. Mold-Resistant, Paper-Faced Products:
 - a. American Gypsum Company; M-Bloc Type X.
 - b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall.
 - c. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - e. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board.
 - f. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board.
 - g. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in.
 - h. Substitutions: See Section 016000 - Product Requirements.
- B. Impact Resistant Wallboard:
 - 1. Application: As indicated on Drawings.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 8. Glass Mat-Faced Type: Gypsum wallboard, as defined in ASTM C1658/C1658M.
 9. Type: Fire-resistance-rated Type X, UL or WH listed.
 10. Thickness: 5/8 inch.
 11. Edges: Tapered.
 12. Paper-Faced Products:
 - a. American Gypsum Company; M-Bloc IR Type X.
 - b. CertainTeed Corporation; Extreme Impact Resistant Drywall with M2Tech.
 - c. National Gypsum Company; Gold Bond Hi-Impact XP Gypsum Board.
 - d. Substitutions: See Section 016000 - Product Requirements.
 13. Glass Mat Faced Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant.
 - b. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough VHI.
 - c. Substitutions: See Section 016000 - Product Requirements.
- C. Tile Backing Board:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
 - a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
 - b. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - c. Available Products:
 - 1) Georgia-Pacific Gypsum; DensShield Tile Backer.
 - 2) National Gypsum Company; Gold Bond eXP Tile Backer.
 - 3) USG Corporation; Durock Glass-Mat Tile Backerboard
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch.
 3. Edges: Tapered.
- E. Exterior Sheathing Board for Ceilings and Soffits: Sizes to minimize joints in place; ends square cut.
1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 2. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
 3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 4. Edges: Square.

5. Available Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Exterior Sheathing.
 - b. CertainTeed Corporation; GlasRoc Exterior Sheathing.
 - c. Georgia-Pacific Gypsum; DensGlass Sheathing.
 - d. National Gypsum Company; Gold Bond eXP Sheathing.
 - e. USG Corporation; USG Securock Brand Ultralight Glass-Mat Sheathing.

2.02 GYPSUM BOARD ACCESSORIES

- A. Sound Attenuation Batts: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness sized to fit metal stud cavity.
 - B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant. Refer to sealant AS-1 in Division 07 Section "Joint Sealants."
 - C. Putty Pads: Non-hardening endothermic material, in pad form, faced on both sides with poly liner, designed to seal around penetrations and wiring devices, enhancing acoustic performance. Provide at all walls indicated to have sound attenuation batting or STC-rating.
 1. Nominal Size: 7-1/4 x 7-1/4 x 3/16 inches.
 2. Available Products:
 - a. 3M; Fire Barrier Moldable Putty Pads MPP+.
 - b. Hilti; Firestop Putty Pad, CFS-P PA.
 - c. Specified Technologies, Inc.; SpecSeal Putty Pad.
 - D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 1. Corner Beads: Low profile, for 90 degree outside corners.
 2. L-Bead, LC-Bead, and U-Bead: Sized to fit gypsum wallboard size(s) indicated.
 - a. Provide LC-bead at exposed panel edges and U-bead at concealed panel edges, unless otherwise indicated. Provide L-bead at locations indicated.
 - E. Metal Edge Trim for "Cloud" Suspended Ceilings: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for a complete trim system.
 1. Trim Height: 4 inches.
 2. Finish: Baked enamel; white.
 3. Available Products:
 - a. Armstrong World Industries, Inc.; Axiom Classic.
 - b. Certainteed; Terminus Perimeter Trim.
 - c. Chicago Metallic Corp.; Infinity System.
 - d. USG Corporation; Compasso Suspension Trim.
 - F. Acoustic Partition Closure at Storefront or Curtain Wall: Multi-piece rectangular-section assembly of nested U-shape aluminum extrusions for finished closure between aluminum storefront or curtainwall system vertical mullion (and glass where indicated), and partition assembly. Closure shall allow for movements of framing and glass it attaches to, and shall not allow direct metal to glass contact. Fill cavity of partition closure with acoustic batt insulation.
 1. Thickness: Aluminum closure plates not less than 0.125-inch thick.
 2. Acoustic Rating: Provide product with a minimum tested STC rating of 55.
 - a. Acoustic Material: Fungi- and microbe-resistant foam, Class A rated when tested per ASTM E 84.
 3. Acoustical Sealant: Seal both ends of partition closure with acoustical sealant.
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4. Finish: Powder coat; color selected by Architect from manufacturer's full range.
5. Available Products:
 - a. Gordon, Inc; Mullion Mate.
 - b. Mull-It-Over Products; Mull-It-Over.
- G. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
- H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- I. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.
 1. Available Manufacturers:
 - a. Fry Reglet.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 - d. Stockton Products.
 2. Flat, horizontal-to-horizontal application: 2-inch wide with three rows of vent slots for a minimum of 3 square inches of opening per linear foot.
 3. Finish: High performance organic coating; color selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Sound Attenuation Batts: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 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.
 - 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. Install gypsum board with an open horizontal joint (gap) not to exceed 5/8-inch above finished floor slab, and tape and finish vertical joints to bottom edge of board to afford a smooth substrate for applied wall base.
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- G. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
- H. Glass Mat Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- I. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints in compliance with ASTM C 840, consistent with lines of building spaces, and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings. Provide vent area specified.
- D. Putty Pads: Install putty pads on the backside of items penetrating gypsum board on STC-rated walls/partitions or walls/partitions indicated to have sound attenuation batts. Items include, but are not limited to, wiring devices, cable, conduit, and pipe. Completely cover and seal around each penetration.

3.05 JOINT TREATMENT

- A. 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 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- B. 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.
- C. 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.
- D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 PROTECTION

- A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 092900

**SECTION 093000
TILING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.
- C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.
- D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship.
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive.
- F. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy.
- H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- J. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- K. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.
- L. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.
- M. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
- N. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- O. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
- P. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar.
- Q. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- R. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.
- S. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting at the Project Site one week before starting work of this section; require attendance by affected installers.
 - 1. Review substrate preparation requirements.
 - 2. Review each type of tile, mortar, grout, and TCNA installation methods.
 - 3. Review requirements for waterproofing and/or crack isolation membrane(s).

1.03 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
 - 1. Include waterproofing details at floor drains, shower pans, cove base, and thresholds.
- C. Installer's Qualification Statement.
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.
 - 2. Submit documentation of completion of apprenticeship and certification programs.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have documented experience of work similar in scope, materials, and design to that indicated for this Project, with a record of successful in-service performance, with references upon request. Installer shall hold company-wide accreditation or employ individuals with one of the listed certifications (comply with at least one):
 - 1. Company-wide accreditation from one of the following:
 - a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).
 - 2. Installer Certification:
 - a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
 - b. Apprenticeship Program: Installer has achieved Journeyworker status through an apprenticeship from the International Union of Bricklayers and Allied Craftworkers (IUBAC) or a U.S. Department of Labor (DOL)-recognized program.

1.05 MOCK-UPS

- A. See Section 014000 - Quality Requirements for general requirements for mock-up.
- B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
 - 1. Provide mock-up of minimum 5 square feet for each type of floor tile, unless otherwise indicated.
 - 2. Provide mock-up of minimum 5 square feet for each type of wall tile, unless otherwise indicated.
 - 3. Approved mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store tile, grout, and mortar off the ground, protected from weather and water infiltration.
- B. Store products in unopened containers or packages until ready for use.
- C. Protect materials from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature and humidity at levels required by referenced ANSI and TCNA tile standards, and per manufacturer's instructions.

PART 2 PRODUCTS

2.01 TILE

- A. Glazed Wall Tile, Type GWT-1: ANSI A137.1 standard grade.
 - 1. Size: 3 by 12 inch, nominal; 5/16-inch thick.
 - 2. Edges: Cushioned.
 - 3. Surface Finish: High gloss.
 - 4. Color(s): To be selected by Architect from manufacturer's full range.
 - 5. Pattern: To be selected by Architect from manufacturer's full range..
 - 6. Products:
 - a. Mosaic Tile; Basis of Design Refer to drawings
 - b. Roca Tile
 - c. Dal-Tile.
- B. Porcelain Tile, Type P-TILE-1: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 12 by 24 inch, nominal.
 - 3. Thickness: 3/8 inch.
 - 4. Edges: Square.
 - 5. Surface Finish: Unglazed.
 - 6. Through body color
 - 7. Color(s): As indicated on drawings.
 - 8. Pattern: To be selected by Architect from manufacturer's full range .
 - 9. Products:
 - a. Dal-Tile - Marazzi - Basis of Design refer to drawings
 - b. Crossville, Inc.
 - c. Roca Tile

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Open edges of wall tile.
 - b. Open edges of floor tile.
 - c. Wall corners, outside and inside.

- d. Transition between floor finishes of different heights.
- e. Thresholds at door openings.
- f. Expansion and control joints, floor and wall.
- g. Floor to wall joints.
- 2. Manufacturers:
 - a. Schluter-Systems.
 - b. Genesis APS International.
 - c. Blanke.

2.03 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Applications: Use this type at all locations where thinset mortar is indicated, unless otherwise indicated.
 - 2. Products:
 - a. Custom Building Products; VersaBond Professional Thin-Set Mortar.
 - b. H.B. Fuller Construction Products, Inc.; TEC Full Flex TA 390/391.
 - c. LATICRETE International, Inc.; 252 Silver.
 - d. MAPEI Corporation; Ultraflex 2.
 - e. Summitville Tiles, Inc.; S-1000 MP Thin-Set Latex Mortar.
- C. Improved Latex-Portland Cement Dry-Set Mortar (Thinset): ANSI A118.15 and ISO 13007 "C2" classification.
 - 1. Applications: Use this type of mortar where indicated.
 - 2. Products:
 - a. H.B. Fuller Construction Products, Inc; TEC 3N1 Performance Mortar.
 - b. LATICRETE International, Inc; LATICRETE 254 Platinum.
 - c. MAPEI Corporation; Ultraflex 3.

2.04 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3 stain-resistant epoxy grout.
 - 1. Applications: Where indicated.
 - 2. Heat Resistance: Tested by manufacturer for continuous exposure up to 140 deg F, and intermittent exposure up to 212 deg F.
 - 3. Color(s): To be selected by Architect from manufacturer's full range.
 - 4. Products: GRT-1 & GRT-2, Refer to drawings for Basis of Design
 - a. H.B. Fuller Construction Products, Inc; TEC AccuColor EFX Epoxy Special Effects Grout.
 - b. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout.
 - c. MAPEI Corporation; Kerapoxy CQ.
- C. Water-Cleanable Chemical- and Heat-Resistant Epoxy Grout: ANSI A118.3 epoxy grout, also meeting applicable requirements of ANSI A118.5 for chemical resistance.
 - 1. Applications: Where indicated.
 - 2. Heat Resistance: Tested by manufacturer for continuous exposure up to 140 deg F, and intermittent exposure up to 350 deg F.

3. Chemical Resistance: Tested per ASTM C 267 for intermittent exposure to the following chemicals and concentrations, with no staining:
 - a. Citric Acid: 20%.
 - b. Phosphoric Acid: 25%.
 - c. Sodium Hydroxide: 10%.
 - d. Sodium Hypochlorite (Bleach): 3%.
 - e. Mineral Spirits.
4. Color(s): To be selected by Architect from manufacturer's full range.
5. Products:
 - a. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout.
 - b. LATICRETE International, Inc; LATICRETE SPECTRALOCK 2000 IG.
 - c. MAPEI Corporation; Kerapoxy IEG CQ.
 - d. Summitville Tiles, Inc; S-5100 NovaColor.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealants: Moisture- and mildew-resistant type sealants; one-part silicone for wall applications and multi-part urethane for floor applications. Sealants and accessories shall comply with requirements below and with requirements of Division 7 Section "Joint Sealants."
 1. Color(s): As selected by Architect from manufacturer's full line. Sealant colors shall match grout colors in adjacent joints unless otherwise indicated.
 2. Silicone Sealant (Walls): ASTM C 920, Type S, Grade NS, Class 25; Uses NT (non-traffic), G (glass), A (aluminum), O (other substrates indicated).
 - a. Products:
 - 1) GE Silicones, a division of GE Specialty Materials; SCS1700 Sanitary.
 - 2) Pecora Corporation; Pecora 898 NST.
 - 3) Tremco Inc.; Tremsil 200.
 3. Urethane Sealant (Floors): ASTM C 920, Type M, Grade P, Class 25; Uses T (traffic), M (mortar), A (aluminum), O (other substrates indicated).
 - a. Products:
 - 1) Master Builders Solutions; MasterSeal SL 2.
 - 2) Pecora Corporation; NR-200 Urexpan.
 - 3) Sika Corporation; Sikaflex-2c SL.
 - 4) Tremco Inc.; THC-901.
 4. Sealant Accessories: Provide backer rod, primer, and other sealant accessories as recommended by sealant manufacturer for applications required.
 - B. Grout Sealer: Liquid-applied, penetrating, moisture and stain protection for existing or new Portland cement grout.
 1. Composition: Water-based colorless silicone.
 2. Products:
 - a. Custom Building Products; Aqua Mix Sealer's Choice Gold.
 - b. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer.
 - c. SGM, Inc.; Grout Sealer.
 - d. Summitville Tiles, Inc.; SL-99 Summitseal II.
 - C. Tile Sealer: Stain protection for exposed surfaces of unglazed ceramic tile, other porous tile, and grout. Provide penetrating sealer with no sheen, preserving natural tile appearance.
 1. Products:
-

- a. Custom Building Products; Aqua Mix Sealer's Choice Gold.
 - b. Rust-Oleum Corporation; Miracle Sealants 511 Impregnator Natural Looking Penetrating Sealer.
 - c. STONETECH, a division of LATICRETE international, Inc; STONETECH Heavy Duty Sealer.
- D. Grout Release: Temporary, water-soluble pre-grout coating.
- 1. Products:
 - a. Custom Building Products; Aqua Mix Grout Release.
 - b. MAPEI Corporation; UltraCare Grout Release.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
- 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
 - 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 40 mils, maximum.
 - c. Products:
 - 1) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane.
 - 2) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane.
 - 3) Merkrete, by Parex USA, Inc; Merkrete Fracture Guard.
- B. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
- 1. Crack Resistance: No failure at 1/8 inch gap, minimum; comply with ANSI A118.12.
 - 2. Fluid or Trowel Applied Type with Embedded Reinforcing Fabric:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 30 mils, minimum, dry film thickness.
 - c. Products:
 - 1) Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - 2) H.B. Fuller Construction Products, Inc; TEC HydraFlex Waterproofing Crack Isolation Membrane.
 - 3) LATICRETE International, Inc; 9235 Waterproofing Membrane.
 - 4) MAPEI Corporation; Mapelastic AquaDefense.
 - 5) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000.
 - 6) Summitville Tiles, Inc.; S-9000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work, per ANSI A108.01, and are ready to receive tile.
 - B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
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- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. For ease of cleaning and to prevent staining, precoat tile with temporary grout release. For unglazed ceramic and other porous tile types, provide either combination tile sealer/grout release, or a temporary grout release with final tile sealer applied after tile installation.

3.03 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F122/F122A, over combination waterproofing/crack-isolation membrane, with latex-Portland cement grout.
 - 1. Provide modified dry-set mortar in a standard thinset bed, except provide LHT mortar in a 5/8-inch medium bed at all large format tile (tile 12 inches or greater in any dimension).
- B. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
 - 2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.

3.05 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.
- B. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.
- C. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

- A. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 093000

**SECTION 095100
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate grid layout and related dimensioning.
- B. Product Data: Provide data on suspension system components, acoustical units, and specialty ceiling products as indicated.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Panels: Quantity equal to 2 percent of total installed, of each type.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Provide each acoustical ceiling assembly (ceiling panel and suspension system) from a single manufacturer to obtain manufacturer's system warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver until building is weather-tight and conditioned.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent damage and to prevent marring and soiling of finished surfaces.

1.05 FIELD CONDITIONS

- A. Maintain uniform temperature and humidity at occupancy conditions during and after acoustical unit installation. Allow products to acclimatize prior to installation.

1.06 WARRANTY

- A. System Warranty: Provide a single source system warranty covering both acoustical ceiling panels and suspension system.
 - 1. Warranty shall cover material failures including sag, warping, shrinkage, or delamination, biologic growth including mold or mildew, and rusting of suspension system.
 - 2. Warranty Period: Minimum 15 years, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Each acoustical ceiling shall be Class A rated, with flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.
- B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7, which references applicable requirements of ASTM E580/E580M "Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions." for Seismic Design Category indicated on Structural Drawings and complying with local authorities having jurisdiction.

2.02 ACOUSTICAL PANELS

- A. Acoustical Panels - General: ASTM E1264, Class A.
 - 1. Antibacterial/Antimicrobial Treatment: Provide acoustical panels that have been factory-treated by manufacturer for resistance to bacteria, mold, mildew, and fungus.
 - 2. Humidity/Sag Treatment: Provide acoustical panels that have been factory-treated by manufacturer for humidity and sag-resistance.
- B. Acoustical Panels ACP-1: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - a. Form: 2, water felted.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 3/4 inch.
 - 4. Light Reflectance: Not less than 0.82, determined in accordance with ASTM E1264.
 - 5. NRC Range: Not less than 0.70, determined in accordance with ASTM E1264.
 - 6. Panel Edge: Square.
 - 7. Color: White.
 - 8. Suspension System: Exposed grid.
 - 9. Products:
 - a. Armstrong World Industries, Inc; School Zone Fine Fissured - Item #1713.
 - b. CertainTeed Ceilings, Inc; Fine Fissured High NRC - Item #HHF-457 HNRCX.
 - c. USG Corporation; Radar High-NRC Acoustical Panels - Item #22421.
- C. Acoustical Panels ACP-3: Mineral fiber with membrane-faced overlay, with the following characteristics:
 - 1. Classification: ASTM E1264 Type IV.
 - a. Form: 2, water felted.
 - b. Pattern: "E" - lightly textured.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 3/4 inch.
 - 4. Light Reflectance: Not less than 0.86, determined in accordance with ASTM E1264.
 - 5. NRC Range: Not less than 0.70, determined in accordance with ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
 - 7. Panel Edge: Square.
 - 8. Color: White.
 - 9. Products:

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- a. Armstrong World Industries, Inc; Ultima Health Zone - Item #1935.
 - b. CertainTeed Ceilings, Inc.; Performa Rx Symphony m - Item #1222-RSX-1.
 - c. USG Corporation; Mars Healthcare - Item #86169.
- D. Acoustical Panels ACP-2: Glass fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type XII.
 - a. Form: 2, cloth.
 - 1) Pattern: "E" - lightly textured.
 - b. Size: 24 by 24 inches and 24 by 48 inches, as indicated on Drawings.
 2. Thickness: Not less than 1 inch.
 3. Light Reflectance: Not less than 0.90, determined in accordance with ASTM E1264.
 4. NRC Range: Not less than 0.95, determined in accordance with ASTM E1264.
 5. Articulation Class (AC): Not less than 190, determined in accordance with ASTM E1264.
 6. Panel Edge: Square.
 7. Tile Edge: Square.
 8. Color: White.
 9. Suspension System: Exposed.
 10. Products:
 - a. Armstrong World Industries, Inc; Optima - Item #3152 and #3153.
 - b. CertainTeed Ceilings, Inc; Symphony f - Item #1342-IOF-1 and #1340-IOF-1.
 - c. USG Corporation; Halcyon Acoustical Panels - Item #98221 and #98241.
- E. Acoustical Panels [ACP-4]: Quadratic Ceiling Panel: Acoustically diffusing panel designed in accordance with quadratic theory with multiply wells engineered depth in molded thermoplastic panel
1. Size: 48 inches x 48 inches by 0.125 inch thick
 2. Finish: Manufacturer's White
 3. Ceiling Panel Mounted Method: Lay-in ceiling grid. All panels include safety cable attachment to permanent ceiling grid in all four corners of panel.
 4. Unit Weight: 35 lb
 5. Acoustical Performance: Sound Absorption Coefficients, One-third Octave Band Center Frequency, Hz, for 48 by 96 inches unit, Mounting Type E-400
 - a. 125Hz = 0.36
 - b. 250Hz = 0.54
 - c. 500Hz = 0.59
 - d. 1000Hz = 0.43
 - e. 2000Hz = 0.24
 - f. 4000Hz = 0.19
 6. Fabric Facing Material: 100 percent woven plan weave polyester 2-ply, with the following characteristics:
 - a. Light Fastness: AATCC 16, Option 3: 40 Hours
 - b. Fastness to Crocking: AATCC 8, #4 Wet & Dry
 - c. Flammability: ASTM E 84, Class A or 1
 - d. Basis of Design: Guilford of Maine FR-701
 7. Fire Rating: The fully assembled product, as installed, shall meet Class A fire protection.
 8. Layout: Final panel placement to be coordinated with School
-

9. Products:
 - a. Wenger Quadratic Ceiling Diffuser Basis of Design
 - b. Acoustical Solutions Inc
 - c. Armstrong Ceiling & Wall Solutions
10. Product to be selected by Architect from manufacturer's full range

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
 2. Cross Tee/Main Runner Connection: Override (stepped).
 3. Main Runner End Coupling: Bayonet ("stab") type; knuckle type is not acceptable.
- B. Exposed Suspension System, Type ACP-3: Hot-dipped galvanized steel grid with aluminum cap.
 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 2. Coating: Provide minimum G60 hot-dip galvanized coating.
 3. Profile: Tee; 15/16 inch face width.
 4. Finish: Baked enamel.
 5. Color: White.
 6. Products:
 - a. Armstrong World Industries, Inc; Prelude Plus XL Fire Guard.
 - b. CertainTeed Ceilings, Inc; 15/16" EZ Stab Classic Environmental System.
 - c. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System.
 - d. Substitutions: See Section 016000 - Product Requirements.
- C. Exposed Suspension System, Type ACP-1, ACP-2: Hot-dipped galvanized steel grid and cap.
 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 2. Profile: Tee; 15/16 inch face width.
 3. Finish: Baked enamel.
 4. Products:
 - a. Armstrong World Industries, Inc; Prelude XL 15/16".
 - b. CertainTeed Ceilings, Inc; 15/16" EZ Stab Classic System.
 - c. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACOUSTICAL CLOUDS/CANOPIES

- A. Acoustical Clouds/Canopies (Auditorium): Prefabricated shapes with consistent size and finish.
 1. Classification: ASTM E1264 Type XII.
 - a. Form: 2, cloth.
 - b. Pattern: "E" - Lightly Textured; or "G" - Smooth.
 2. Shape: Convex; custom size and shape as indicated on Drawings.
 3. Panel Thickness: 7/8-inch.

4. Suspension: Provide manufacturer's standard individual mounting kit for each panel, consisting of aircraft cables, anchors at each end, and method for fine adjustment after installation. Provide minimum 4 anchors/cables per panel.
5. Color: White.
6. Products:
 - a. Basis-of-Design: Armstrong World Industries, Inc; SoundScapes Shapes.
 - b. Certainteed; Ecophon Solo Clouds. (1-1/2 inch thick)
 - c. USG Corporation; Halcyon Canopies (1 inch thick).

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Coordinate with Division 05 Section "Metal Fabrications" to provide slotted channel framing between primary structural components for attachment of hangers where required.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
 - B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
 - C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 1. Use longest practical lengths.
 - D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 1. Do not hang suspension system directly from steel floor or roof deck.
 - E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
 - F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
 - G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
 - H. Do not eccentrically load system or induce rotation of runners.
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3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
- F. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

**SECTION 096466
WOOD ATHLETIC FLOORING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- D. MFMA (PUR) - Performance and Uniformity Rating Sport Specific Standards.
- E. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate slab recess and leveling requirements for submitted wood flooring system with concrete installer.
 - 1. Unless otherwise allowable by manufacturer; slab shall be leveled smooth to a tolerance of 1/8-inch per 10 foot radius, non-cumulative.

1.03 SUBMITTALS

- A. Product Data: Provide data for flooring, subflooring, floor finish materials, resilient cushion, and game insert or socket devices.
- B. Shop Drawings: Indicate floor joint pattern and termination details.
 - 1. Indicate provisions for expansion and contraction, wall base, and game insert or socket devices.
 - 2. Indicate size and type fasteners and anchors.
 - 3. Indicate location, size, design, and color of game markings.
- C. Selection Samples: Provide manufacturer's color charts for wood floor finish and for game line paint.
- D. Verification Sample: Provide an assembly sample of manufacturer's floor system; approximately 12 inches square, with selected material and finish.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Maintenance Data: Include maintenance procedures and recommended maintenance materials.
- G. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with MFMA (SPEC).
- B. Installer Qualifications: Company specializing in installing products specified in this section.
 - 1. MFMA accredited and approved by flooring manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and store off the floor in a well-ventilated, weather-tight space.

1.06 FIELD CONDITIONS

- A. Do not deliver or install wood flooring until wet construction work is complete and permanent heat and air conditioning is installed and operating.
- B. Maintain room temperature between 55 degrees F and 75 degrees F and relative humidity between 35 to 50 percent for a period of seven days prior to delivery of materials to installation space, during installation, and after installation.
- C. Acclimate wood flooring materials to installation space for a minimum of 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Athletic Flooring (WSF-1):
 - 1. Action Floor Systems.
 - 2. Connor Sports Flooring.
 - 3. Infinity Wood Floors.
 - 4. Robbins Sports Surfaces.
 - 5. Substitutions: See Section 016000 - Product Requirements

2.02 WOOD ATHLETIC FLOORING

- A. General: Wood athletic flooring, MFMA (PUR) compliant for application indicated; system components provided by single manufacturer.
- B. Application: Gymnasium.
- C. System Description:
 - 1. Fixed, cushioned with steel channel and plywood subfloor system; wood strip flooring.
 - 2. Basis-of-Design: Infinity Wood Floors; Acer PowerPlay Panel.
 - 3. Basis-of-Design System Thickness: 1-3/4 inches.

2.03 COMPONENTS

- A. Wood Strip Flooring:
 - 1. Provide MFMA grade-marked flooring, stamped as manufactured by MFMA member mill.
 - 2. Species: Northern hard maple, kiln dried; tongue and groove edges, end matched.
 - 3. Grade: Second and better.
 - 4. Thickness: 25/32 inch.
 - 5. Width: 2-1/4 inches.
 - B. Subflooring: One layer of 23/32 inch thick plywood, APA rated, exposure 1, minimum span rating of 48/24.
 - C. Channels: 16-gauge galvanized steel, manufacturer's standard size and shape for system indicated.
 - D. Resilient Cushioning: Manufacturer's standard rubber pads, factory-applied to bottom side of sleepers.
 - E. Vapor Retarder: Polyethylene sheet, 6 mil thick; 2 inch wide tape for sealing sheet seams.
 - F. Fasteners and Anchors: Manufacturer's standard type and size to suit application.
 - 1. Provide 1-1/2 inch steel drive pins for anchorage of channels to concrete slab unless otherwise required to ensure 1-inch minimum penetration into concrete.
-

2.04 FINISHES

- A. Floor Finishes: Types recommended by flooring manufacturer and complying with MFMA specifications.
 - 1. Manufacturers:
 - a. Bona.
 - b. Hillyard Inc.
 - c. Poloplaz.
 - 2. Sealer: Oil based urethane.
 - 3. Finish Coats: Oil based urethane; high gloss.
 - 4. Game Marking Paint: Compatible with sealer and finish coats; colors as indicated on drawings.
 - a. Provide two colors for game marking lines; primary color shall be used for basketball court and secondary color for volleyball.
 - b. Refer to Division 01 Section "Allowances" for an allowance for a center court logo. Owner shall provide high-resolution logo image after bidding.

2.05 ACCESSORIES

- A. Ventilating Base: Molded rubber, 4 inch high with a 3 inch toe, pre-molded outside corners; black color.
- B. Edge Strip: Angle; mill finish aluminum.
- C. Game Sleeves and Insert Devices: Cast aluminum type, with anchors. Coordinate with Division 11 Section "Gymnasium Equipment."
- D. Moisture Vapor Treatment: Where wood flooring and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
 - 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; Perdure MVT.
 - b. Maxxon Corporation; Maxxon MVP.
 - c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
 - 2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting this work.
 - B. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet.
-

- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows: Provide two of each type of test in gymnasium, in opposing corners of the room.
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare substrate to receive wood flooring in accordance with manufacturer's and MFMA instructions.
- B. Vacuum clean substrate.

3.03 INSTALLATION

- A. Place vapor retarder over concrete surface, overlap seams a minimum of 6 inches and seal with tape.
- B. Resilient Underlayment: Install in accordance with manufacturer's instructions.
- C. Channel Sleepers with Plywood Subfloor:
 - 1. Place sleepers at 90 degree angle to direction of finished floor; space 12 inches on center. Stagger end joints a minimum of 24 inches.
 - 2. Anchor sleepers to concrete substrate with steel anchoring pins.
 - 3. Fasten plywood subfloor over sleepers at 90 degree angle to direction of finished floor. Allow minimum 1/4 inch between plywood subfloor edges.
- D. Install solid blocking at doorways, under stacked bleachers, and under locations of heavy equipment, as applicable and in accordance with flooring manufacturer's recommendations.
- E. Wood Flooring:
 - 1. Install in accordance with manufacturer's and MFMA instructions.
 - 2. Lay flooring parallel to length of main playing area. Blind nail or staple to subfloor.
 - 3. Install edge strips at unprotected or exposed edges, and where flooring terminates.
 - 4. Provide 2 inch expansion space at walls and other interruptions.
- F. Install base at floor perimeter to cover expansion space in accordance with manufacturer's instructions. Miter inside corners.
- G. Install floor sleeves, sockets and inserts to a depth sufficient to ensure flush top surface with floor surface.
- H. Finishing:
 - 1. Mask off adjacent surfaces before beginning sanding.
 - 2. Sand flooring to smooth even finish with no evidence of sander marks. Remove dust by vacuum.
 - 3. Apply finishes in accordance with floor finish manufacturer's and MFMA instructions.
 - 4. Apply one sealer coat and two finish coats.

5. Apply first coat, allow to dry, then buff lightly with recommended pad to remove irregularities. Vacuum clean and wipe with damp, lint-free cloth before applying succeeding coats.
6. Apply game lines/markers in accordance with layout indicated on drawings.
7. Apply last coat of finish.

3.04 CLEANING

- A. Clean floor surfaces in accordance with floor finish manufacturer's instructions.

3.05 PROTECTION

- A. Prohibit traffic on finished floor for 72 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION 096466

**SECTION 096467
DANCE FLOORING ASSEMBLIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- D. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate slab recess depth requirement and floor flatness tolerances for submitted wood flooring system with concrete installer prior to concrete slab installation.

1.03 SUBMITTALS

- A. Product Data: Provide data for subflooring, resilient cushion, and floor finish materials.
- B. Shop Drawings: Indicate floor joint pattern and termination details.
 - 1. Indicate provisions for expansion and contraction and wall base.
 - 2. Indicate size and type fasteners and anchors.
 - 3. Indicate location, size, design, and color of game markings.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and store off the floor in a well-ventilated, weather-tight space.

1.05 FIELD CONDITIONS

- A. Do not deliver or install flooring until wet construction work is complete and permanent heat and air conditioning is installed and operating.
- B. Maintain room temperature between 55 degrees F and 75 degrees F and relative humidity between 35 to 50 percent for a period of seven days prior to delivery of materials to installation space, during installation, and after installation.
- C. Acclimate flooring components and materials to installation space for a minimum of 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Dance Flooring System:
 - 1. Gerstung.
 - 2. Stagestep.
 - 3. Harlequin.
 - 4. Substitutions: See Section 016000 - Product Requirements

2.02 DANCE FLOORING ASSEMBLY

- A. General: system components provided by single manufacturer.
-

- B. Application: Dance room.
- C. System Description:
 - 1. Semi-permanent installation.
 - 2. Sprung dance floor system, consisting of cushioned pads with plywood tongue-and-groove joint subfloor panels, and engineered hardwood dance flooring surface.
 - 3. All components of dance floor system shall be provided by the primary dance flooring manufacturer, or by a manufacturer specifically approved in writing by dance flooring manufacturer.
 - 4. Wood performance surface appropriate for all dance types, including tap dance.
 - 5. Basis-of-Design System: Harlequin Flexity Sprung Floor System with engineered hardwood surface.

2.03 COMPONENTS

- A. Engineered Hardwood Flooring (WSF-2):
 - 1. Provide MFMA grade-marked flooring, stamped as manufactured by MFMA member mill.
 - 2. Species: Manufacturer's approved engineered hardwood surface with black stained birch underlayment, kiln dried; tongue and groove edges, end matched.
 - 3. Grade: Second and better.
 - 4. Thickness: Manufacturer's standard.
 - 5. Width: Manufacturer's standard.
- B. Subflooring: One layer of 23/32 inch thick plywood, APA rated, exposure 1; with machined anchor pockets for channels and factory applied resilient cushions.
- C. Resilient Cushioning: Manufacturer's standard cushioning pads, factory-applied to bottom side of subflooring.
- D. Vapor Retarder: Polyethylene sheet, 6 mil thick; 2 inch wide tape for sealing sheet seams.
- E. Fasteners and Anchors: Manufacturer's standard type and size to suit application.

2.04 FINISHES

- A. Sprung Dance Floor Finishes: Types recommended by flooring manufacturer and complying with MFMA specifications.
 - 1. Sealer: Oil based urethane.
 - 2. Finish Coats: Oil based urethane; high gloss.

2.05 ACCESSORIES

- A. Ventilating Base: Molded rubber, 4 inch high with a 3 inch toe, pre-molded outside corners; color as selected by Architect.
- B. Ramp: Provide type compatible with flooring system.
- C. Edge Strip: Angle; anodized aluminum.
- D. Moisture Vapor Treatment: Where dance floor system and accessories are installed over concrete slabs, and where field testing indicates high moisture vapor content through concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab in accordance with Division 1 MVT allowance and unit price, and per the following:
 - 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; Perdure MVT.

- b. Maxxon Corporation; Maxxon MVP.
- c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
- 2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows: Perform one of each test per 1,000 sf of installation area.
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare substrate to receive wood flooring in accordance with manufacturer's and MFMA instructions.
- B. Vacuum clean substrate.

3.03 INSTALLATION

- A. Place vapor retarder over prepared concrete surface, overlap seams a minimum of 6 inches and seal with tape.
- B. Resilient Underlayment: Install in accordance with manufacturer's instructions.
- C. Channels with Plywood Subfloor:
 - 1. Install subfloor assembly with channel sleepers at 90 degree angle to direction of finished floor. Stagger end joints a minimum of 24 inches.
 - 2. Anchor subfloor assembles to concrete substrate with steel anchoring pins.
- D. Install solid blocking at doorways, under stacked bleachers, and under locations of heavy equipment, as applicable and in accordance with flooring manufacturer's recommendations.
- E. Install floor sleeves and inserts to a depth sufficient to ensure flush top surface with floor surface.

F. Finishing:

1. Mask off adjacent surfaces before beginning sanding.
2. Sand flooring to smooth even finish with no evidence of sander marks. Remove dust by vacuum.
3. Apply finishes in accordance with floor finish manufacturer's and MFMA instructions.
4. Apply one sealer coat and two finish coats.
5. Apply first coat, allow to dry, then buff lightly with recommended pad to remove irregularities. Vacuum clean and wipe with damp, lint-free cloth before applying succeeding coats.
6. Apply last coat of finish.

3.04 CLEANING

- A. Clean floor surfaces in accordance with floor finish manufacturer's instructions.

3.05 PROTECTION

- A. Prohibit traffic on finished floor for 72 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION 096467

**SECTION 096513
RESILIENT BASE AND ACCESSORIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base.
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- F. ASTM F2169 - Standard Specification for Resilient Stair Treads.
- G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- H. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Selection Samples: Submit manufacturer's complete set of color **chart** for Architect's initial selection.
- C. Verification Samples: Submit in manufacturer's standard size, illustrating color and pattern for each resilient flooring product specified after initial selection.
- D. 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: 10 linear feet of each type and color.
 - 3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.03 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. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- C. Protect roll materials from damage by storing on end.

1.04 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Maintain conditions at occupancy conditions for installation and until Substantial Completion.

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Resilient Base - RB-1: ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
 - 1. Products (Type TP):
 - a. Johnsonite, a Tarkett Company; Rubber Wall Base - Cove. Basis of Design
 - b. Flexco, Inc.
 - c. Roppe Corporation; 700 Series TPR Wall Base - Style B (Coved).
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 3. Height: 4 inch.
 - 4. Thickness: 0.125 inch minimum.
 - 5. Finish: Satin.
 - 6. Length: Roll; manufacturer's standard length.
 - 7. Color: To be selected by Architect from manufacturer's full range.

2.02 STAIR COVERING

- A. Stair Treads: RSR/RST; Rubber; full width and depth of stair tread in one piece; tapered thickness.
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company Basis of Design
 - b. Flexco, Inc
 - c. Roppe Corporation.
 - 2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Nominal Thickness: 0.250 inch, tapered towards rear.
 - 5. Nosing: Square, adjustable; 1-1/2 inch height.
 - 6. Striping: 2 inch wide contrasting color strip.
 - 7. Texture: Bamboo basis of design, pattern selected from manufacturer's full range
 - 8. Color: To be selected by Architect from manufacturer's full range.
- B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
 - 1. Manufacturer: Provide risers by same manufacturer as treads.
 - 2. Thickness: 0.125 inch.
- C. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
 - 1. Nominal Thickness: 0.080 inch.

2.03 MOLDINGS, TRANSITIONS, AND EDGE STRIPS

- A. Moldings, Transition and Edge Strips:
 - 1. Manufacturers:
 - a. Johnsonite
 - b. Flexco.
 - c. Roppe Corporation.

2. Molding/Transition Strip Profiles: Provide in sizes as required to suit flooring thicknesses and applications.
 - a. Transition strip between different types of materials that are the same height or between different styles/patterns of the same material.
 - b. Slim transition strip with approximately 1/4-inch wide visible transition profile.
 - c. Reducer strip at edges of flooring to reduce height to 0".
3. Material: Manufacturer's standard rubber or vinyl.
4. Color: To be selected by Architect from manufacturer's full range.

2.04 ACCESSORIES

- A. Leveling Compound: Blended cement mix, latex-modified, for use as trowelable underlayment, approved by resilient accessory manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; Perdure MVT.
 - b. Maxxon Corporation; Maxxon MVP.
 - c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
 2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

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.
 1. Do not apply wall base until other finish items, including casework and painting, are complete.
- C. Cementitious Subfloor Surfaces (Stair Treads/Landings): Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710, when required by stair accessory manufacturer.

- b. Internal Relative Humidity: ASTM F2170. One test per stair area.
- c. Moisture Vapor Emission: ASTM F1869. One test per stair area.
- 2. If test results are not within limits recommended by stair accessory manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with leveling compound to achieve smooth, flat, hard surface.
- C. Prohibit traffic until leveling compound is fully cured.
- D. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Fit joints and butt seams tightly.
 - 2. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, install such that molding profiles or transition strips are centered under the door panel.
- E. Install edge/reducer strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.

3.04 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Job form internal and external corners in accordance with manufacturer's instructions. Form corners by "V" cutting or scribing; do not bend material in a manner that creates stress whitening.
- D. In addition to walls, install base on other permanent construction with exposed vertical faces at floor level, including, but not limited to, columns, pilasters, and casework/cabinet knee and toe spaces.
- E. Scribe and fit to door frames and other interruptions.
- F. At uneven substrate surfaces (such as masonry mortar joints), provide manufacturer's recommended filler sealant or adhesive to fill voids along top of base.

3.05 INSTALLATION - STAIR COVERINGS

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Install stringers configured tightly to stair profile.
- C. Adhere over entire surface. Fit accurately and securely.
- D. Clean stair tread and landing accessories and apply floor polish according to manufacturer's written instructions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient accessories for 48 hours after installation.
- B. Cover resilient accessories and protect from heavy construction traffic and equipment until Substantial Completion.

END OF SECTION 096513

**SECTION 096519
RESILIENT TILE FLOORING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- C. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading.
- D. ASTM F1344 - Standard Specification for Rubber Floor Tile.
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- H. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers.

1.02 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Shop Drawings: Indicate seaming plans, floor patterns, and dye lot.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- 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 Flooring Material: 5 percent of each type and color, but not less than one full box
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.

- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.05 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide a ten (10) year manufacturer warranty, covering defective material and installation.
- C. Installer's Warranty: Installer shall warrant that the products have been installed in accordance with manufacturer's instructions.
 - 1. The installer shall provide a ten (10) year warranty against product failure due to excessive moisture vapor transmission through the slab.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Enhanced Vinyl Composition Tile (Quartz Tile) - EVCT: Solid, homogenous tile with 70% natural quartz content and 15% vinyl.
 - 1. Manufacturers:
 - a. Kahrs Flooring; Upofloor Quartz. Basis of Design refer to drawings
 - b. Rikett America; Rikett Quartz Tile.
 - c. Biltrite Texas Granite
 - 2. Minimum Requirements: Comply with ASTM F1700, Class I (Monolithic Vinyl Tile) or ASTM F1066, Class 2 (Through-Pattern).
 - a. Type: Type A, Smooth Surface.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Size: 17.7 x 17.7 inch or 24 x 24 inch square tiles.
 - 5. Thickness: 0.080 inch (2 mm), 0.100 inch (2.5 mm), or 0.120 inch (3 mm), as standard with manufacturer.
 - 6. **Color and Pattern:** match color and pattern indicated on drawings as basis of design. Must coordinate with accoustical panels specified as basis of design

2.02 ACCESSORIES

- A. Subfloor Filler: Type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
 - 1. VOC Content Limits: As specified in Section 016116.
- C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, and where field testing indicates high moisture vapor testing through concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab in accordance with Division 01 MVT allowance and unit price, and per the following:
 - 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:

- a. Duraamen Engineered Products, Inc.; Perdure MVT.
- b. Maxxon Corporation; Maxxon MVP.
- c. Themec Company Inc.; Epoxoprime MVT, Series 208.
2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- D. Adhesive for Vinyl Flooring:
 1. Manufacturers:
 - a. H.B. Fuller Construction Products, Inc; TEC Flexera Premium Universal Adhesive: www.tecspecialty.com/#sle.
 - b. Loba-Wakol, LLC; WAKOL D 3120 PVC Adhesive: www.loba-wakol.com/#sle.
 - c. Stauf USA, LLC; D737 High-Tack: www.staufusa.com/#sle.
- E. Moldings, Transition and Edge Strips: Same material as flooring.

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. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows: Perform one of each test per 1,000 sf of installation area.
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.

- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Fit joints and butt seams tightly.
 - 2. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern, unless otherwise indicated.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.06 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096519

**SECTION 096566
RESILIENT ATHLETIC FLOORING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- F. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems.
- G. CHPS (HPPD) - High Performance Products Database.
- H. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.
- I. SCS (CPD) - SCS Certified Products.
- J. UL (GGG) - GREENGUARD Gold Certified Products.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's printed data sheets for products specified.
- B. Shop Drawings: Fabrication and installation details. Include layout, color(s), dye lot, and orientation.
 - 1. Indicate columns, electrical outlets, athletic equipment inserts, and other floor penetrations or items installed through resilient athletic flooring.
- C. Selection Samples: Manufacturer's color charts for flooring materials specified, indicating full range of colors and textures available.
- D. Verification Samples: Actual flooring material specified, of each selected color, in manufacturer's standard size square samples after final selection is made
 - 1. Include samples of game lines, illustrating colors selected.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Installer's qualification statement.
- G. Maintenance Data: For resilient athletic flooring.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and certified/approved by flooring manufacturer for installation of specified flooring system.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.05 FIELD CONDITIONS

- A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

- A. Vinyl Sheet Flooring (RAF):
1. Wearing Surface: Pure polyvinyl chloride, mechanically extruded and uniformly resilient material with uniform color throughout thickness.
 2. Backing: Dual-Density Foam.
 3. Basis of Design: Taraflex Sport M Plus Dry-Tex System includes moisture mitigation system integrated in backing
 4. 15-Year No Mold Guarantee
 5. VOC Content: Certified as Low Emission by one of the following :
 - a. Product listing in UL (GGG).
 - b. FloorScore certified product listing in SCS (CPD).
 6. Sheet Thickness: Minimum 7.5 mm.
 - a. Wear Layer Thickness: Minimum 2.0 mm.
 7. Sheet Width: Minimum 48 inches.
 8. Sheet Lengths: As necessary to minimize transverse seams.
 9. Shock Absorption: Class 3 (minimum 34%), when tested per ASTM F2772.
 10. Tensile Strength: Minimum 1000 psi, per ASTM D412.
 11. Durometer Hardness, Type A: Minimum of 65, when tested in accordance with ASTM D2240.
 12. Seaming Method: Welding with heat or chemical.
 13. Surface Texture: Smooth.
 14. Color: To be selected by Architect from manufacturer's full range.
 15. Game Lines: Paint as approved by manufacturer of vinyl sheet flooring.
 16. Top Coat: If required by manufacturer for additional UV protection, a clear polyurethane coating that protects game lines and wearing surface.
 17. Products:
 - a. Gerflor USA, Inc; Taraflex Sport M Plus with DryTex.
 - b. Mondo America, Inc; Vinylsport or Advance Pro 10mm
 - c. Tarkett Sports; Omnisports PurePlay with Tarkolay.

2.02 ACCESSORIES

- A. Low-Emitting Materials:
1. Paints & Coatings: field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) and shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.

2. Adhesives and Sealants: Adhesives and sealants field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) and shall meet the chemical content requirements of SCAQMD 1113.
- B. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- C. Moisture Vapor Treatment: Where resilient flooring and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; Perdure MVT.
 - b. Maxxon Corporation; Maxxon MVP.
 - c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
 2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- D. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.
- E. Game Line and Marker Paint: Provide paint type recommended by flooring manufacturer for compatibility and adhesion
 1. Provide 2 colors selected by Architect from manufacturers's full range; primary(basketball) and secondary (volleyball)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710, when required by flooring manufacturer.
 - b. Internal Relative Humidity: ASTM F2170. One test per installation area.
 - c. Moisture Vapor Emission: ASTM F1869. One test per installation area.
 2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.
- C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.
- D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Resilient Sheet Flooring:
 - 1. Unroll flooring and allow to relax before beginning installation.
 - 2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
 - 3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
 - 4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
 - 5. Weld seams using techniques and equipment recommended by manufacturer.
 - 6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
 - 7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.
- D. Extend flooring into accessory spaces (such as closets, wall recesses, or toe spaces) and to center line of cased openings or center line of door leaf at door openings, unless otherwise indicated. Where transitions occur between resilient athletic flooring and other flooring types, extend or cut flooring to suit transition.

3.04 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

- A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 096566

**SECTION 096623
RESINOUS MATRIX TERRAZZO FLOORING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- D. NTMA (GRAD) - Aggregate Gradation Standards.
- E. NTMA (EPOXY) - Epoxy Terrazzo Specifications.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate slab recess dimensions with concrete installer.
 - 1. For precast terrazzo tile, coordinate complete installation thickness with elevator manufacturer to ensure elevators' plywood subflooring is installed at proper height to accommodate system.
- B. Preinstallation Meeting: Convene a preinstallation meeting at the Project site one week before starting work of this section. Require attendance by concrete subcontractor and any other relevant installers.
 - 1. Review the work of this section, including substrate requirements, including slab recesses, control joints, and preparation.
 - 2. Review scheduling, material deliveries, and temporary facilities and equipment that will be required, and installation procedures.
 - 3. Review specialty finishes, patterns and designs. Review special conditions such as stair treads and nosings.
 - 4. Review protection of the finished work, including traffic limitations and protection measures.

1.03 SUBMITTALS

- A. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.
 - 1. Include product data for manufacturer's moisture vapor treatment product.
- B. Shop Drawings: Indicate complete terrazzo layout, including patterns and colors. Indicate divider strip and control and expansion joint layout, and details of adjacent components.
 - 1. Include stair tread, riser, and landing details.
- C. Verification Samples: Include terrazzo samples approximately 6 inches square illustrating project-specific colors, chip size and variation, chip gradation, and matrix color.
- D. Installer's Qualification Statement.
- E. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing. Include specific cleaners and chemicals that should not be used on terrazzo.
- F. Manufacturer's Inspection Reports.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with NTMA's "Terrazzo Specifications and Design Guide" and with recommendations as posted at their web site at www.ntma.com.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
 - 1. Associate member firm of the National Terrazzo and Mosaic Association, Inc.
- C. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Contractor member of the National Terrazzo and Mosaic Association, Inc.
- D. Coordination: Epoxy terrazzo flooring manufacturer shall review and approve cast-in-place concrete contractor's quality control measures and shop drawings to ensure concrete slab placement, slab recesses, and finish are acceptable for application of terrazzo.

1.05 MOCK-UP

- A. Construct mock-up of terrazzo illustrating appearance of finished work in each configuration required. Size mock-up to be not less than 100 square feet.
 - 1. Include control joint(s) with divider strip, and include multiple adjacent colors to verify color selections, as applicable.
 - 2. Include a section with terrazzo wall base.
 - 3. Include a mock-up of, at minimum, three stair treads/risers.
- B. Locate where directed.
- C. Approved mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store terrazzo materials in a dry, secure area.
- B. Maintain minimum temperature of 60 degrees F.
- C. Keep products away from fire or open flame.

1.07 FIELD CONDITIONS

- A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.
- B. Prior to and during each day of installation, the terrazzo contractor shall verify that the dew point is at least 5 degrees F less than the slab and air temperature.
- C. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.
- D. Provide ambient lighting with permanent lighting or with lighting that simulates facility's permanent lighting.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Resinous Matrix Terrazzo Flooring:
 - 1. Crossfield Products Corp.; Dex-O-Tex Division; Cheminert.
 - 2. Key Resin Company; Key Epoxy Terrazzo System.
 - 3. Master Terrazzo Technologies LLC; Morricite.
 - 4. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.

5. Sherwin-Williams High Performance Flooring; Terrazzo 1100.
6. TEC Specialty Construction Brands, Inc; Tuff-Lite Epoxy Terrazzo.
7. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.

2.02 EPOXY MATRIX TERRAZZO APPLICATIONS

- A. Floors: TERR-E
 1. Thickness: 3/8 inch, nominal.
 2. Color(s): To be match EVCT colors, Refer to drawings for basis of design
 3. Aggregate Type: 80% Marble chips. Size: 0-1
 4. Aggregate Type: 20% Glass chips, Size: 0-1.
- B. Wall Base:
 1. Thickness: Same as floors.
 2. Style: Coved.
 3. Color(s): Same as adjacent floor.
 4. Aggregate Type and Size: Same as floors.
 5. Trim: install satin anodized aluminum finish strip

2.03 MATERIALS

- A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
 1. Mix Proportions: As required to achieve appearance specified.
- B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.
- C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.
- D. Finishing Grout: Epoxy, color to match terrazzo matrix.

2.04 ACCESSORIES

- A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Sealer: Colorless, non-yellowing, non-strippable, penetrating liquid urethane type to completely seal matrix surface; not detrimental to terrazzo components.
 1. Products:
 - a. Essential Industries, Inc; T-Rx.
 - b. Master Terrazzo Technologies; Morricite WB Urethane Sealer 158.
 - c. Terrazzo & Marble Supply Companies; Terroxy WB Urethane Sealer.
- E. Primer: Manufacturer's recommended product; compatible with indicated substrate.
- F. Concrete Flexible Joint Reinforcement Membrane: Resinous type with fiberglass scrim.

- G. Moisture Vapor Treatment: Provide terrazzo manufacturer's recommended alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
1. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.3 perm per ASTM E 96.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.

2.05 PREMANUFACTURED TERRAZZO TILE (ELEVATOR FLOORING)

- A. Premanufactured Terrazzo Tile: Beveled-edge, epoxy-based terrazzo tile
1. Size: 18-inch square or 24-inch square nominal, manufacture's standard thickness
 2. Finish: Honed
 3. Slip Resistance: Dynamic coefficient of friction (DCOF) not less than 0.42
 4. Color: To match field color of floor in corridor
 5. Trim units: Provide 4 inch high cove base, thickness and color to match floor
- B. Installation Materials:
1. Crack Isolation/Uncoupling Membrane:
 - a. Products:
 - 1) Custom Building Products: RedGard Uncoupling Mat
 - 2) Laticrete: Strata Mat
 - 3) Schluter Systems: DITRA Uncoupling Membrane
 2. Mortar Latex-Potland Cement LHT Mortar Install in 3/8-inch medium bed
 - a. Products:
 - 1) Custom Building Products: ProLite Premium Rapid Setting Large Format Tile Mortar
 - 2) Laticrete: 257 Titanium
 - 3) Mapei Corporation: Ultraflex LFT
 3. Grout: High Performance Modified Grout, ANSI A118.7
 - a. Products:
 - 1) Custom Building Products: Prism Color Consistant Gout
 - 2) Laticrete: Laticrete Permacolor Grout
 - 3) Mapei Corporation: UltraColor Plus

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 terrazzo.
- B. Cementitious Subfloor Surfaces: Install manufacturer's recommended moisture vapor treatment at all locations to receive terrazzo floor finish in accordance with manufacturer's instructions; moisture vapor treatment at terrazzo is not subject to MVT unit price or allowance specified in other sections.
-

- C. Verify that any required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Clean substrate of foreign matter.
- B. Prepare concrete subfloor by shot-blasting surface in accordance with manufacturer's instructions, and according to ICRI Technical Guidelines for CSP 3 or 4 surface profile.
 - 1. Acid washing and/or grinding of concrete slabs is not allowed.
 - 2. Review vacuum blasted concrete slab substrate for cracks with the terrazzo manufacturer's technical representative. Rout out and fill significant non-moving cracks with epoxy resin, and patch lesser non-moving cracks with fine mesh strip set into wet primer and embedded in epoxy resin as recommended by technical representative.
 - 3. Provide an epoxy or cementitious pre-fill material manufactured or recommended by epoxy flooring manufacturer and compatible with flooring system to fill low slab areas to attain acceptable substrate. This companion material is considered part of the epoxy terrazzo flooring system and shall be included in the system warranty. Gypsum composition underlayment pre-fill material is not acceptable.
- C. Apply flexible reinforcing membrane to cracks and construction joints in accordance with manufacturer's instructions. Reinforce with fiberglass scrim.
- D. Apply primer in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install control joint strips straight and flat to locations indicated.
- B. Install divider strips according to pattern indicated on Drawings and approved on shop drawings.
- C. Install terminating cap strip at top of base; attach securely to wall substrate. Place terrazzo mix over substrate to thickness indicated
- D. Do not exceed NTMA's recommended maximum spacing for control and divider strips between sections of terrazzo.
- E. Place terrazzo mix over substrate to thickness indicated.

3.04 FINISHING

- A. Finish terrazzo to NTMA requirements.
- B. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.
- C. Apply grout to fill voids exposed from grinding.
- D. Remove grout coat by grinding, using a fine grit abrasive.
- E. Grind with stones 800 grit or finer until all grout is removed from surface. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding. Produce surface with a minimum of 70 percent aggregate exposure. Provide level of finish and polish accepted by the Owner from the approved samples.

3.05 TOLERANCES

- A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.
- B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.06 FIELD QUALITY CONTROL

- A. Provide on-site inspection by terrazzo manufacturer's representative at minimum two times during installation of this work. Installing Contractor shall notify manufacturer of installation start date and scheduling. Manufacturer's representative shall provide written copies of inspection reports within 10 days of inspection date.
 - 1. The first inspection shall be of the mockup, or, if no mockup is specified, of the first 100 square feet of the install.
 - 2. The second inspection shall be at substantial completion.
 - 3. The installing contractor shall be responsible for immediate repairs or corrections to the work.

3.07 CLEANING

- A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.
- B. Immediately after terrazzo has dried, apply sealer in accordance with NTMA and manufacturer's instructions.
- C. Polish surfaces in accordance with manufacturer's instructions.

3.08 PROTECTION

- A. Do not allow traffic on installed terrazzo for the period required by manufacturer's instructions, or 24 hours, whichever is longer.
- B. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.
- C. Leave the finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective terrazzo work. Repair or replace defective terrazzo work to attain the specified NTMA standards for finished work. The party responsible for the damaged or otherwise non-conforming work shall be responsible for the cost of repairs.

END OF SECTION 096623

**SECTION 096700
FLUID-APPLIED FLOORING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- B. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- C. ASTM D905 - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading.
- D. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- I. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.02 ADMINSTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.
 - 2. Notify Architect four calendar days in advance of scheduled meeting date.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- B. Selection Samples: Provide manufacturer's color charts illustrating full range of patterns and colors for each flooring material for Architect's initial sample request.
- C. Verification Samples: Manufacturer's standard size physical samples, on rigid backing, illustrating each selected pattern and 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. Applicator's Qualification Statement.
- G. Field Quality Control Reports: Submit inspection reports of manufacturer's technical representative.
- 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.

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; certified and approved by manufacturer in writing.
 1. Approved by manufacturer.

1.05 MOCK-UPS

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 1. Number of Mock-Ups to be Prepared: One per flooring
 2. Use same materials and methods for use in the work.
 3. Use approved design samples as basis for mock-ups.
 4. Locate where directed by Architect.
 5. Minimum Size: Entire Room
- B. See Section 014000 - Quality Requirements for additional requirements.
- C. Obtain approval of mock-up by Architect before proceeding with work.
- D. 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 between 60-80 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.
- D. The relative humidity in the specific location of the application shall be less than 85% and the surface temperature shall be at least 5F above the dewpoint.
- E. Concrete shall be moisture cured for a minimum of 3 days and have fully cured for a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
- F. Concrete shall have a flat rubbed finish, float or light steel trowel finish.
- G. Sealers and curing agents should not be used.
- H. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system
- I. Concrete shall have a minimum design strength of 3,500 psi and a maximum water/cement ration of 0.45.

1.08 WARRANTY

- A. Fluid-Applied Flooring Warranty: Provide a one (1) year manufacturer warranty, covering defective material and faulty installation.
-

- B. Moisture Warranty: Provide a ten (10) year warranty covering damage due to moisture vapor emission under the flooring system.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING RES-B

- A. Manufacturers:
1. Dur-A-Flex, Inc. Hybri-Flex, Micro-Chip Blend - Basis of Design
 2. Sherwin Williams FasTop Deco Flake SL45.
 3. Dudick steri-Crete SLF.
 4. Substitutions: See Section 016000 - Product Requirements.; Above products include inherent Moisture Vapor Treatment
- B. Systems Material
1. Topping: SL resin, hardener, and SL aggregate
 - a. Percent Reactive - 100%
 - b. VOC - 0 g/L
 - c. Bond Strength to Concrete ASTM D454 - 400 psi
 - d. Compression Strength, ASTM C579 - 9,000 psi
 - e. Tensile Strength, ASTM D638 - 2,175 psi
 - f. Flexural Strength, ASTM D790 - 5,076 psi
 - g. Impact Resistance @ 125 mils, MIL D3134 - 160 inch lbs
 2. Broadcast: Aggregate shall be a Micro Chip with Glaze, epoxy based two-compartment resin
 - a. Percent Reactive - 100%
 - b. VOC - <4 g/L
 - c. Water Absorption, ASTM D570 - 0.04%
 - d. Tensile Strength, ASTM D638 - 4,000 psi
 - e. Coefficient of Thermal Expansion ASTM D696 - 2×10^{-5} in/in/F
 - f. Flammability ASTM D635 - Self-Extinguishing
 - g. Flame Spread / NFPA 10 ASTM E84 - Class A
 3. Grout Coat: Epoxy base 2-compartment resin
 - a. Percent Reactive - 100%
 - b. VOC - <4 g/L
 - c. Water Absorption, ASTM D570 - 0.04%
 - d. Tensile Strength, ASTM D638 - 4,000 psi
 - e. Coefficient of Thermal Expansion ASTM D696 - 2×10^{-5} in/in/F
 - f. Flammability ASTM D635 - Self-Extinguishing
 - g. Flame Spread / NFPA 10 ASTM E84 - Class A
 4. Topcoat: Armor Top aliphatic urethane 2-compartment resin with grit
 - a. VOC - 0 g/L
 - b. 60 Degree Gloss ASTM D523 0 75+/-5
 - c. Mixed Viscosity, (Brookfield 25C) - 500 cps
 - d. Tensile Strength, ASTM D638 - 7,000 psi
 - e. Abrasion Resistance, ASTM D4060
CS17 wheel (1,000 g load) cycles:
-

Gloss: 4 mg loss w/ grit, 10 mg loss w/o grit

Satin: 8 mg loss w/ grit, 12 mg loss w/o grit

- f. Pot life @ 70 deg F 50% RH
- g. Dry Properties:
 - 70 deg F, 50% RH 8hrs tack free, 12hrs dry
 - 60 deg F, 30% RH 12hrs tack free, 18hrs dry
 - 80 deg F, 70% RH 4hrs tack free, 6hrs dry
- h. Flash Point PMCC - 186 deg F
- i. Full Chemical Resistance - 7 days

C. Patch Materials

- 1. Shallow Fill and Patching - Poly Crete MD (up to 1/4" thick)
- 2. Deep Fill and Sloping Material (over 1/4") Poly Crete WR

2.02 FLUID-APPLIED FLOORING RES-A (KITCHEN)

A. Manufacturers:

- 1. Dur-A-Flex, Inc. PolyCrete SLB/TF - Basis of Design
- 2. Sherwin Williams FasTop Multi TopFloor SL23.
- 3. Dudick Shock-Crete SLF.
- 4. Substitutions: See Section 016000 - Product Requirements. Above products included Inherent Moisture Treatment

B. Systems Material

- 1. Topping: Poly-Crete SL
 - a. Percent Reactive - 100%
 - b. VOC - 0 g/L
 - c. Bond Strength to Concrete ASTM D454 - >400 psi substrates fail
 - d. Compression Strength, ASTM C579 - 9,000 psi
 - e. Tensile Strength, ASTM D638 - 2,175 psi
 - f. Flexural Strength, ASTM D790 - 5,076 psi
 - g. Impact Resistance @ 125 mils, MIL D3134 - Pass
- 2. Topcoat: Poly-Crete TF PLUS
 - a. Percent Solids - 100%
 - b. VOC - 0 g/L
 - c. Comprehensive Sstrength ASTM C579 -
 - d. Tensile Strength, ASTM D638 - 750 psi
 - e. Flexural Strength ASTM D790 - 4,400 psi
 - f. Abrasion Resistance ASTM C501 -
 - g. PDS Taber CS17, 1,000 gm load, 1,000 cycles - 40 mg weight loss
 - h. Hardness, Shore D - 85
 - i. Potlife @ 77F - 15 minutes

2.03 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Where a specific Basis-of-Design value is indicated, minor variations in test numbers shall be permitted for comparable/substitute products at Architect's discretion.
 - 1. Compressive Strength: 10,000 psi, when tested in accordance with ASTM C579 (Basis-of-Design).
-

2. Tensile Strength: 3,700 psi, when tested in accordance with ASTM C307 or ASTM D638 (Basis-of-Design).
 3. Abrasion Resistance: Maximum weight loss of 4 mg, when tested in accordance with ASTM D4060 (Basis-of-Design).
 4. Impact Resistance: No cracking, chipping or delamination, when tested with Gardner Impact Tester at 16 ft lbs.
 5. Adhesion: Minimum 300 psi at concrete substrate failure, per ASTM D 4541.
- B. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648.
- C. Slip Resistance: Minimum dynamic coefficient of friction (DCOF) of 0.42, when tested in accordance with NFSI / ANSI B101 Standard.

2.04 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring Type RES-A & RES-B: Epoxy base coat(s), polyurethane top coat, decorative vinyl aggregate.
1. System Thickness: 3/16 inch, nominal, dry film thickness (DFT).
 2. Texture: Slip resistant.
 3. Sheen: High gloss.
 4. Color: To be selected by Architect from manufacturer's full range.

2.05 ACCESSORIES

- A. Base Caps: Zinc with projecting base of 1/8 inch; color as selected.
- B. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- C. Primer: Type recommended by fluid-applied flooring manufacturer. Manufacturer's primer with integral moisture vapor treatment may be used in lieu of topical moisture vapor treatment specified below, where manufacturer has approved primer for use with specified system, and where manufacturer certifies moisture mitigation warranty for use with primer and specified system.
- D. Moisture Vapor Treatment: Provide fluid-applied flooring manufacturer's recommended alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
1. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for concrete slabs on-grade and lightweight concrete elevated slabs.

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 subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Install manufacturer's recommended moisture vapor treatment at all locations to receive fluid-applied floor finish in accordance with manufacturer's instructions; moisture vapor treatment at fluid-applied flooring is not subject to MVT unit price or allowance specified in other sections. (Moisture mitigating primer is acceptable in lieu of topical MVT where compliant with system and warranty requirements)
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Prepare concrete surfaces according to ICRI 310.2R, CSP 4, minimum, unless otherwise required by manufacturer's installation requirements..
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

- A. Install cant strips at base of walls where flooring is to be extended up wall as base.
- B. Install terminating cap strip at top of base; attach securely to wall substrate.

3.04 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. At movable partitions install flooring under partitions without interrupting floor pattern.
- E. Install flooring to the center of cased openings, and into door openings such that the transition to other floor material will occur under the center of the door leaf. Where transitions occur to another flooring material, extend resinous flooring to suit transition.
- F. Cove at vertical surfaces.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide services of manufacturer's technical representative to inspect for proper installation of fluid-applied flooring system and submit inspection report.

3.06 PROTECTION

- A. Prohibit traffic on floor finish for minimum 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION 096700

**SECTION 096813
TILE CARPETING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Substitutions/Prequalification: Manufacturers seeking consideration to bid their product as an acceptable alternative shall provide full product data and full range of selection samples during the bid period. Products that do not meet the technical and aesthetic criteria will not be accepted. No substitutions shall be permitted for carpet tile after receipt of bids.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- B. Shop Drawings: Indicate layout of joints, direction of carpet pile, dye lot, and location of edge moldings and transition strips.
 - 1. Where multiple carpet tile products are specified (including multiple products in a single space installed in an indicated pattern), indicate on the shop drawings the locations where each product is being installed.
- C. Selection Samples: Submit manufacturer's color charts indicating full range of colors for carpet tiles and for accessories for initial selection.
- D. Verification Sample: Submit full size sample for each required color, pattern, and texture after approved selection is made.
 - 1. Submit samples in manufacturer's standard size for each accessory product after selection has been approved.
- E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
 - 1. Include specific procedures and materials that are not recommended, including those that may be harmful to carpet tile or that would void warranty.
- 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 Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

- A. Critical Radiant Flux: All carpet tiles shall be Class I rated, with a minimum CRF of 0.45 watts/sq cm, when tested by an independent testing agency in accordance with ASTM E648 or NFPA 253.

1.05 FIELD CONDITIONS, STORAGE AND HANDLING

- A. Comply with the Carpet and Rug Institute (CRI) Publication "CRI 104 - Standard for Installation of Commercial Carpet." Comply with Section 4.0 for storage and handling, Section 7.0 for ambient temperature and ventilation, and Section 9.0 for Product Acclimation.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Carpet Tile Warranty: Provide a minimum ten (10) year manufacturer warranty, covering defective material and faulty installation.
 - 1. Warranty shall cover excessive surface wear (defined as more than 10% loss by weight of face fiber), edge raveling, backing separation, shrinking, stretching, cupping, doming, static electricity, or color loss or fading.

PART 2 PRODUCTS

2.01 TILE CARPETING: C-TILE-A

- A. Manufacturer
 - 1. Interface, Refer to drawings for Basis of Design
 - 2. Mohawk, Inc. Duracolor Tricor Premium Nylon
 - 3. Mannington
- B. Tile Size: 20" x 20" nominal
- C. Fiber: Type 6,6, Type 6 Cationic, or Duracolor Tricore Premium Nylon; Solution Dyed
- D. Pattern: As selected by Architect from manufacturer's full range of product
- E. Color: As selected by Architect from manufacturer's full range, installed product must be from one dye lot
- F. Accent stripe color: Must coordinate with EVCT basis of design color, Custom color if necessary
- G. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 of NFPA 253
- H. Surface Flammability Ignition: Pass ASTM D2859 (the pill test)
- I. Primary Backing Material: Manufacturer's standard, recycled vinyl with fiberglass reinforcing
- J. TARR Rating: > or equal to 3.0 Heavy

2.02 TILE CARPETING: C-TILE-B WALK-OFF TILE

- A. Manufacturer
 - 1. Interface, Refer to drawings for Basis of Design
 - 2. Mannington
 - 3. Mohawk
 - B. Tile Size: 20" x 20" nominal
-

- C. Fiber: Type 6,6, Type 6 Cationic, or Duracolor Tricore Premium Nylon, Solution Dyed
- D. Pattern: As selected by Architect from manufacturer's full range of product
- E. Color: As selected by Architect from manufacturer's full range, installed product must be from one dye lot
- F. Patterned Carpet Colors: Must coordinate with EVCT basis of design, Custom color is necessary
- G. Critical Radiant Fkux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 of NFPA 253
- H. Surface Flamibility Ignition: Pass DOC-FFI-70 (the pill test)
- I. Primary Backing Material: Manufacturer's standard, recycled vinyl with fiberglass reinforcing
- J. TARR Rating: > or equal to 3.5 Severe
- K. Static: AATCC-134 < 3.0 KV
- L. Perservative Efficacy: AATCC 174 Parts 2 & 3, 99% Reduction/No Mold 7 Days (ASTM-2471) Complete Inhibition

2.03 TILE CARPETING: C-TILE-C - H BIOPHILIC PATTERN DESIGN

- A. Manufacturer
 - 1. Interface, Refer to drawings for Basis of Design pattern
 - 2. Mohawk, Inc. Duracolor Tricor Premium Nylon
 - 3. Mannington
- B. Tile Size: 20" x 20" nominal
- C. Fiber: Type 6,6, Type 6 Cationic, or Duracolor Tricore Premium Nylon; Solution Dyed
- D. Pattern: As selected by Architect from manufacturer's full range of product
- E. Color: As selected by Architect from manufacturer's full range, installed product must be from one dye lot
- F. Patterned Carpet Colors: Must coordinate with EVCT basis of design, Custom color if necessary
- G. Critical Radiant Fkux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 of NFPA 253
- H. Surface Flamibility Ignition: Pass ASTM D2859 (the pill test)
- I. Primary Backing Material: Manufacturer's standard, recycled vinyl with fiberglass reinforcing
- J. TARR Rating: > or equal to 3.0 Heavy; TARR Rating > or equal to 2.5 located in low traffic area as indicated on dwg

2.04 TILE CARPETING: C-TILE-I & J ORGANIC PATTERN DESIGN

- A. Manufacturer
 - 1. Interface, Refer to drawings for Basis of Design pattern
 - 2. Mohawk, Inc. Duracolor Tricor Premium Nylon
 - 3. Mannington
 - B. Tile Size: 20" x 20" nominal
 - C. Fiber: Type 6,6, Type 6 Cationic, or Duracolor Tricore Premium Nylon; Solution Dyed
 - D. Pattern: As selected by Architect from manufacturer's full range of product
-

- E. Color: As selected by Architect from manufacturer's full range, installed product must be from one dye lot
- F. Patterned Carpet Colors: Must coordinate with EVCT basis of design colors, Custom color if necessary
- G. Critical Radiant Fkux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 of NFPA 253
- H. Surface Flamibility Ignition: Pass ASTM D2859 (the pill test)
- I. Primary Backing Material: Manufacturer's standard, recycled vinyl with fiberglass reinforcing
- J. TAR Rating: > or equal to 3.0 Heavy

2.05 ACCESSORIES

- A. Subfloor Filler: Type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, color as selected by Architect from manufacturers full range.
- C. Moisture Vapor Treatment: Where carpeting and accessories are installed over concrete slabs, provide alkaline-resistant product designed to control excessive moisture vapor transmission through concrete slab, per the following:
 - 1. Products: Provide product approved by flooring manufacturer and complying with performance requirements below, equivalent to one of the following:
 - a. Duraamen Engineered Products, Inc.; Perdure MVT.
 - b. Maxxon Corporation; Maxxon MVP.
 - c. Tnemec Company Inc.; Epoxoprime MVT, Series 208.
 - 2. Performance Requirements:
 - a. Verify with flooring manufacturer that submitted product maintains compliance with all provisions of flooring manufacturer's warranty.
 - b. Low-VOC: Provide product with VOC content less than 15 g/L.
 - c. Bond Strength to Concrete: Minimum 400 psi per ASTM D 4541 (100% concrete failure).
 - d. Permeance: Maximum 0.1 perm per ASTM E 96, and 0.10 grains/hr/ft²/in-Hg, per ASTM F3010.
 - e. Applications: Provide MVT for all concrete slabs on-grade and lightweight concrete elevated slabs.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows: Perform one of each test per installation area.
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.

2. If test results are not within limits recommended by flooring manufacturer, apply moisture vapor treatment (MVT) in accordance with manufacturer's requirements. MVT shall be provided per unit price and quantity allowance requirements.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines, unless otherwise indicated.
- F. Locate change of color or pattern between rooms or at transitions to other finish flooring material directly under the door leaf centerlines, or at the center of cased openings.
- G. Fully adhere carpet tile to substrate.
- H. Install carpet tile into wall recesses, knee spaces under cabinets or countertops, closets, and other similar spaces.
- I. Trim carpet tile neatly at walls and around interruptions.
- J. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING AND PROTECTION

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.
- C. Protect installed carpet in accordance with CRI 104, Section 13.7 "Post Installation."

END OF SECTION 096813

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's printed data sheets for products specified.
- B. Shop Drawings: Fabrication and installation details, panel layout, fabric orientation, and wood grain orientation.
- C. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.
- D. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- E. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a two-year period for failure of materials or workmanship commencing on the Date of Substantial Completion.
 - 1. Failures include but are not limited to acoustic performance, fabric separation from core or fabric sagging, panel distortion or warping.

PART 2 PRODUCTS

3.01 WOOD FIBER SOUND-ABSORBING UNITS AWP-C

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc; Tectum Direct-Attach.
 - 2. Cardinal Acoustics; Direct Attached Panel.
-

3. Conwed; Arborcoustic.
- B. Wood Fiber Acoustical Panels for Walls: Cementitious wood fiber.
1. Size: 24 by 24 inches.
 2. Thickness: 1 inch.
 3. Noise Reduction Coefficient (NRC): 0.80 minimum when tested in accordance with ASTM C423 for Type C-20 mounting, per ASTM E795.
 4. Panel Edge: Beveled.
 5. Surface Pattern: Coarse.
 6. Surface Color: Manufacturer's standard; panels shall be field-painted.
 7. Installation Method (Wall): Direct-attached over 1 inch depth furring strips and 3 lb rigid/semi-rigid glass fiber acoustic board.
 - a. Furring Strips: 1 inch depth wood furring.
 - b. Fiberboard Insulation: Rigid/semi-rigid mineral fiber, ASTM C612, unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

3.02 FELT PET ACOUSTIC PANELS - AWP-A & AWP-B

- A. Manufacturers:
1. Unika Vaev Basis of Design refer to drawings
 2. Kieri
 3. FitzFelt
- B. Felt Acoustic Panels: (80% post-consumer recycled content)
1. Size: As indicated on Drawings. Provide shop drawings
 2. Thickness & Mounting: Z-Clips 3/4"; Interlock Mounting System 1 1/4"
 3. Edge: Manufacturer's coordinating edge trim, at all exposed edges
 4. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 5. Noise Reduction Coefficient (NRC): 0.65 at 0.53" panel thickness when tested in accordance with ASTM C423 for Type E mounting, per ASTM E795.
 6. Color(s): Digital printed. Design, pattern, and colors shall be selected from manufacturer's full range of available digital prints/colorways.
 - a. Pattern: Custom design
 7. Color: Solid color as selected from manufacturer's full range of available colors. coordinating with basis of design EVCT colors
 8. Color(s): Each individual color to be one dye lot

3.03 ROLLED FELT AWP-D

- A. Manufacturers:
1. Unika Vaev Basis of Design refer to drawings
 2. Kieri
 3. FitzFelt
- B. Felt Acoustic Panels: (80% post-consumer recycled content)
1. Width/Weight: 53" / 10.32 Oz Linear Yard
 2. Thickness: 1mm
 3. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
-

4. Color: Solid color as selected from manufacturer's full range of available colors. coordinating with basis of design EVCT colors
5. Color(s): Each individual color to be one dye lot

3.04 FELT PET ACOUSTIC PANELS - AWP-E

- A. Manufacturers:
 1. Unika Vaev Basis of Design refer to drawings
- B. Felt Acoustic Panels: (80% post-consumer recycled content)
 1. Size: As indicated on Drawings. Provide shop drawings
 2. Edge: Manufacturer's coordinating edge trim, at all exposed edges
 3. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Noise Reduction Coefficient (NRC): 0.85 at 0.98" panel thickness when tested in accordance with ASTM C423 for Type E mounting, per ASTM E795.
 5. Color: Solid color as selected from manufacturer's full range of available colors. coordinating with basis of design EVCT colors
 6. Color(s): Each individual color to be one dye lot

3.05 FABRIC COVERED SOUND ABSORBING/ DIFFUSING UNITS AWP-F

- A. Manufacturer's
 1. Wenger Convex Diffuser & Absorber Wall Panel, Basis of Design
 2. Acoustical Solutions, Imc AlphaSorb
 3. Armstrong Wall Solutions, SoundSoak
- B. Provides up to 0.8 seconds of change in reverberation time
- C. Acoustical Performance: Sound Absorption Coefficients, One-third Octave Band Center Frequency, HZ
 1. 125Hz = 0.36
 2. 250Hz = 0.54
 3. 500Hz = 0.59
 4. 1000Hz = 0.43
 5. 2000Hz = 0.24
 6. 4000Hz = 0.19
- D. Fabric Facing Material: 100 Percent woven plan weave polyester 2-ply, with the following characteristics:
 1. Light Fastness: AATCC 16, Option 3: 40 Hours
 2. Fastness to Crocking: AATCC 8, #4 Wet & Dry
 3. Flammability: ASTM E 84, Class A or 1
 4. Product to be selected by Architect from manufacturer's full range of fabrics
- E. Sides constructed of aluminum extrusions
- F. Five-year warranty

3.06 ACCESSORIES

- A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
-

1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.

PART 3 EXECUTION

4.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

4.02 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
 1. Plumb and level.
 2. Flatness.
 3. Width of joints between panels; where applicable.

4.03 CLEANING

- A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

4.04 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 098430

**SECTION 099100
PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior and interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated. Specific items include (but are not limited to) the following:
 - 1. Fire- and Smoke-Rated Wall Identification: Permanently label fire- and smoke-rated walls, partitions, and barriers per requirements of applicable building code. Labeling shall include fire-resistance rating, type of assembly, and instruction to protect openings/penetrations. Example text: "ONE HOUR FIRE BARRIER - PROTECT ALL OPENINGS".
 - a. Locate lettering in concealed accessible floor, floor-ceiling plenums, and attic spaces, located no more than 15 feet from end of wall and at horizontal intervals not exceeding 30 feet, with stenciled lettering not less than 3 inches high with minimum 3/8-inch strokes. Locate directly inside of access doors or panels that provide access to rated walls. Do not paint walls where exposed to view except in support spaces (mechanical / electrical rooms and similar spaces).
 - b. Locate lettering in concealed accessible floor, floor-ceiling plenums, and attic spaces, at horizontal intervals not exceeding 8 feet, with stenciled lettering not less than 1 inch high with minimum 1/4-inch strokes. Locate directly inside of access doors or panels that provide access to rated walls. Do not paint walls where exposed to view except in support spaces (mechanical / electrical rooms and similar spaces).
 - 2. Refer to the life safety plans and partition schedule on the drawings for rated wall and partition locations.
 - 3. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 4. Elevator pit ladders.
 - 5. Prime surfaces to receive wall coverings.
 - 6. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
 - 7. Shop-Primed Items: In finished areas, paint shop-primed items. Unless specifically indicated that additional field primer is not required, provide a tie coat primer over the shop primer before top coat(s) are applied.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Floors, unless specifically indicated.
7. Ceramic and other tiles.
8. Brick, architectural concrete, architectural precast, cast stone, and integrally colored plaster, fiberglass, or stucco.
9. Glass.
10. Acoustical materials, unless specifically indicated.
11. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 6 - Commercial Blast Cleaning.

1.03 SUBMITTALS

- A. 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. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 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 above the dew point, or to damp or wet surfaces.

- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints:
 - 1. Benjamin Moore.
 - 2. PPG Paints.
 - 3. Sherwin-Williams Company.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Low-Emitting Materials (Paints and Coatings): Paints and coatings field-applied inside the weatherproofing system shall be tested and determined compliant in accordance with CAL (CDPH SM) AND shall meet applicable VOC limits of CARB (SCM) or SCAQMD 1113.
- 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. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 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. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. 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.

3.02 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 repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- 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. 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.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- J. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

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. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.06 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following Paint systems for the various substrates, as indicated. Dry film thickness is noted as "DFT." Provide compatibility test areas on existing painted substrates.
- B. Zinc-Coated or Zinc-rich Primer-Coated Metal with Direct to Metal ("DTM") Gloss Acrylic Enamel Finish: 2 topcoats of DTM gloss enamel over primer, with min. total DFT of 2.5 mils.
 - 1. Prime Coat (Tie-Coat): Lead-free, acrylic base interior/exterior galvanized metal primer, premium grade. Apply over shop primer.
 - a. Moore: HP04 Ultra Spec HP Acrylic Metal Primer.
 - b. PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel.
 - c. S-W: B66 Pro-Cryl Universal Primer.
 - 2. First and Second Coats: DTM Acrylic Gloss Enamel.
 - a. Moore: HP28 Ultra Spec HP Acrylic Gloss Enamel.
 - b. PPG: 90-1310 Pitt-Tech Plus Int/Ext High Gloss DTM Industrial Enamel.
 - c. S-W: B66W1050 Series Pro Industrial DTM Acrylic Coating (Gloss).
- C. Field-Applied Coatings for Ferrous Metal (AESS): Aliphatic urethane system of intermediate coat and topcoat. Provide scheduled products for exposed steel fabrications indicated as AESS.
 - 1. Field Touch-up: Match moisture curing urethane zinc-rich shop primer.
 - 2. Intermediate Coat: Moisture curing urethane and micaceous iron oxide or epoxy.
 - a. Moore: Corotech V160 Epoxy Mastic Coating.
 - b. PPG: 95-245 Pitt-Guard Rapid Coat D-T-R Epoxy Coating.
 - c. S-W: Macropoxy 646 Fast Cure Epoxy, B58-600/B58v600.
 - 3. Top Coat: Aliphatic urethane at 2.0 – 3.0 mils DFT.
 - a. Moore: Corotech V500 Aliphatic Acrylic Urethane.
 - b. PPG: 95-812 Pitthane Ultra Gloss Urethane Enamel.
 - c. S-W: Corothane I Aliphatic Finish Coat B65.
- D. Concrete: Acrylic latex satin finish, two finish coats over alkali-resistant primer with minimum total DFT of not less than 3.5 mils.
 - 1. Prime Coat: Exterior Acrylic weathered masonry sealer/primer.
 - a. Moore: 608 Ultra Spec Masonry Int/Ext 100% Acrylic Sealer/Primer.
 - b. PPG: 4-603 Perma-Crete Int/Ext Alkali Resistant Primer.
 - c. S-W: A24w8300, Loxon Concrete & Masonry Primer.
 - 2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.
 - a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
 - b. PPG: 76-45 Sun-Proof Ext House & Trim, Satin.
 - c. S-W: A82 Series A-100 Exterior Latex Satin.

- E. Concrete Masonry Units: Acrylic latex satin finish, two finish coats over primer with minimum total DFT of not less than 3.5 mils.
 - 1. Prime Coat: Exterior Acrylic weathered masonry sealer/primer.
 - a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
 - b. PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler.
 - c. S-W: A24W200 Loxon Block Surfacers.
 - 2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.
 - a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
 - b. PPG: 76-45 Sun-Proof Ext House & Trim, Satin.
 - c. S-W: A 82 Series A-100 Exterior Latex Satin.
- F. Exterior Gypsum Soffit Board with Smooth Finish 100% Acrylic Coating: Top coat(s) for total DFT of 10.0 mils minimum over primer-sealer.
 - 1. Prime Coat (Tie-Coat): Bonding primer-sealer.
 - a. Moore: N023 Fresh Start All Purpose 100% Acrylic Int/Ex Latex Primer.
 - b. PPG: 6-9 Speedhide Exterior Wood Primer Oil.
 - c. S-W: B51-450, Multi-Purpose Primer.
 - 2. First and Second Finish Coats: Exterior 100% Acrylic – Satin sheen; premium grade.
 - a. Moore: N401 Regal Select Exterior Paint High Build Low Lustre Finish.
 - b. PPG: 76-45 Sun-Proof Ext House & Trim. Satin Latex 100% Acrylic.
 - c. S-W: A82 Series A-100 Exterior Latex Satin.
 - 3. First and Second Finish Coats: Exterior 100% Acrylic – Flat finish; premium grade.
 - a. Moore: N400 Regal Select Exterior Paint High Build Flat Finish.
 - b. PPG: 72-45 Sun-Proof Ext House & Trim. Flat Latex 100% Acrylic
 - c. S-W: A6 Series A-100 Exterior Latex Flat
- G. Exterior Wood Dumpster Enclosure Siding and Trim with Solid Color Latex-Emulsion Stain: 2 Finish coats.
 - 1. Stain Coat: Acrylic latex solid color stain.
 - a. Moore: 610 ArborCoat Exterior Stain - Solid Ultra Flat.
 - b. Cabot: Cabot O.V.T. Solid Color Acrylic Stain.
 - c. PPG: Olympic Solid Color Acrylic Latex Base Stain.
 - d. S-W: A16, Woodscapes Exterior Solid Acrylic Stain.

3.07 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates, as indicated. Dry film thickness is noted as “DFT.” Provide compatibility test areas on existing painted substrates.
- B. Concrete Masonry Units: Low-VOC Acrylic Satin Finish. 2 Coats over filler, with total DFT not less than 2.5 mils. (Provide for CMU except where “epoxy finish” is indicated.)
 - 1. Filler Coat, 100% Acrylic. Apply filler coat at a rate to ensure complete coverage. Brush, spray or roller apply and back roll or squeegee for smooth, pinhole-free treatment.
 - a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
 - b. PPG: 16-90 Pitt Glaze WB Acrylic Interior Exterior Block Filler.
 - c. S-W: B42W46 Heavy Duty Block Filler. (PrepRite not acceptable)
 - 2. Waterproofing Filler Coat – Showers & Wet Applications: Cementitious resin or epoxy block filler applied by brush, spray or roller and back rolled or squeegeed for smooth, pinhole-free treatment.
 - a. Moore: P31 Waterborne Epoxy Block filler.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- b. PPG: 95-217 Epoxy Ester Cementitious Waterproofing Block Filler.
- c. S-W: B42W400/B42V401 Kem Cati-Coat HS Epoxy Filler/Sealer.
- 3. Bonding Primer (previously painted): Acrylic bonding primer for exceptional adhesion to hard, glossy surfaces. Test for adhesion. Brush, spray or roller apply and back roll.
 - a. Moore: Stix Bonding Primer.
 - b. PPG: 17-921 PPG Seal Grip Acrylic Universal Primer/Sealer.
 - c. S-W: B51W150 Extreme Bond Interior/Exterior Primer.
- 4. First & Second Finish Coats: Commercial Interior Low-VOC Acrylic Satin Finish. Provide for wall finishes unless directed otherwise.
 - a. Moore: N538 Ultra Spec 500 Interior Eggshell Finish.
 - b. PPG: 6-4300 Speedhide Zero VOC Interior Eggshell Latex.
 - c. S-W: B20-2600 ProMar 200 Zero VOC Interior Latex Eg-Shel.
- C. Concrete Masonry Units - Semi-Gloss Water-Borne Epoxy Finish: 2 Coats over filler:
 - 1. Block Filler Coat: Acrylic-latex or as required by manufacturer for topcoat. Brush, spray or roller apply and back roll for smooth pinhole-free treatment.
 - a. Moore: 571 Ultra Spec Hi-Build Masonry Block Filler.
 - b. PPG: 6-15 Speedhide Int/Ext Acrylic Masonry Block Filler.
 - c. PPG: 16-90 Pitt-Glaze WB Int/Ext Block Filler Latex.
 - d. S-W: B42W46 Heavy Duty Interior/Exterior Block Filler.
 - 2. First and Second Coats: Two-component, semi-gloss water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat.
 - a. Moore: Corotech V400 Polyamide Epoxy Coating.
 - b. PPG: 98-100 Aquapon WB Water Base Epoxy – Semi-Gloss.
 - c. S-W: B73V300 Pro Industrial Water Based Catalyzed Epoxy Hardener.
- D. Concrete Floor with Gloss Water-Base Epoxy Floor Enamel: 2 Coats over primer on cured surface. Concrete must cure a minimum of 30 days before painting and have pH of 10.0 or lower. Prepare per SSPC-SP13, shot blast or prepare floor by other means acceptable to paint manufacturer (accepted in writing) prior to painting.
 - 1. Primer Coat: Epoxy primer, brush or roller applied over prepared concrete. Provide 1.5 - 2.0 mils DFT per coat or as recommended by manufacturer.
 - a. Moore: P41 Fast Dry Epoxy Floor Sealer/Finish.
 - b. PPG: 98-1 Series Aquapon WB Water Base Epoxy 2.0 mils to 3.0 mils DFT per coat.
 - c. S-W: B70-8100/B70V8100 Armorseal 8100 Water based Epoxy Floor Coating.
 - 2. Two Finish Coats: Two-component waterborne catalyzed polyamide epoxy floor enamel or comparable performance enamel. Provide 1.5 - 2.0 mils DFT per coat or as recommended by manufacturer.
 - a. Moore: P42 Waterborne Polyamide High Gloss Epoxy Enamel 2.0 mils to 3.0 mils DFT per coat.
 - b. PPG: 98-1 Series Aquapon WB Water Base Epoxy 2.0 mils to 3.0 mils DFT per coat.
 - c. S-W: B70-8100/B70V8100 Armorseal 8100 Water based Epoxy Floor Coating.
- E. Gypsum Board Systems with Latex Finish: Satin (egg-shell) finish at walls and flat finish on ceilings except as indicated otherwise. Provide Low-VOC formulation with 0 VOC per EPA test method 24.
 - 1. Filler Coat: 0 VOC (per EPS test method 24) Latex Primer.
 - a. Moore: N372 Eco-Spec WB Zero VOC Primer.
 - b. PPG: 9-900 Pure Performance Interior Latex Primer.
 - c. S-W: B11W44 Harmony Low Odor Interior Latex Primer.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

2. First & Second Finish Coats: Interior Low-VOC Acrylic Satin Finish. (Low luster/Satin = 25-45% @60°) Provide for wall finishes unless indicated otherwise.
 - a. Moore: N374 Eco-Spec WB Zero VOC Eggshell.
 - b. PPG: 9-300 Pure Performance Interior Eggshell Latex.
 - c. S-W: B9 Harmony Low Odor Interior Latex Eggshell.
 3. First & Second Finish Coats: Interior Low-VOC Acrylic Flat Finish. Provide for ceiling applications unless indicated otherwise.
 - a. Moore: N373 Eco-Spec WB Zero VOC Flat
 - b. PPG: 9-100 Pure Performance Interior Latex Primer
 - c. S-W: B5 Harmony Low Odor Interior Latex Flat
- F. Gypsum Board Systems with Water-Borne Polyamide Epoxy Finish ("EPX"):
1. Filler Coat: Manufacturer's recommended primer.
 - a. Moore: 217 Fresh Start Alkyd Enamel Underbody.
 - b. PPG: 6-2 Speedhide Interior Latex Sealer.
 - c. S-W: B28W2600 ProMar 200 Zero VOC Primer.
 2. First and Second Coats: Two-component, water born polyamide epoxy enamel applied at a DFT of 1.5 to 4.0 mils per coat. Provide semi-gloss finish unless directed otherwise.
 - a. Moore: Corotech V440 Waterborne Amine Epoxy.
 - b. PPG: 98-100 Aquapon WB Water Base Epoxy – Semi-Gloss.
 - c. S-W: B70 Series B60V25 Water Based Catalyzed Epoxy.
- G. Ferrous Metal with Latex Dry Fog Finish: One finish coat over primed exposed construction. Provide nominal 50 square foot sample area to test for paint compatibility with substrates.
1. Prime Coat: (Acrylic or recommended VOC-compliant metal primer for surfaces not pre-primed.) 2.0 mils DFT.
 - a. Moore: N110 Superkote 5000 DryFall latex Flat.
 - b. PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel.
 - c. S-W: B66-310 Pro-Cryl Universal Primer.
 2. Top Coat: All exposed structure as scheduled. Acrylic Dry Fog 3.0 mils DFT. Provide color finish as selected by Architect from manufacturer's full range.
 - a. Moore: N110 Superkote 5000 DryFall Latex Flat.
 - b. PPG: 6-724XI Series Speedhide Super Tech WB Int. Dry-Fog Flat Latex Flat.
 - c. S-W: B42 BW3 Waterborne Acrylic Dry Fall, Flat.
- H. Ferrous Metal: Direct to Metal ("DTM") Acrylic Enamel Finish: 2 Coats over primer, with total DFT not less than 2.5 mils. Provide satin finish at hollow metal steel doors and frames, and semi-gloss at other applications.
1. Prime Coat: Lead-free, acrylic Base Primer. Not required on shop primed items.
 - a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
 - b. PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel.
 - c. S-W: B66 W1 DTM Acrylic Primer/Finish (or B66 W200).
 2. Bonding Primer (previously painted): Acrylic bonding primer designed for previously painted ferrous metal to ensure secure bond. Brush, spray or roller apply and back roll.
 - a. Moore: SXA-110 Insl-X Waterborne Bonding Primer.
 - b. PPG: 90-912 Pitt-Tech Plus DTM Industrial Primer.
 - c. S-W: B66A50 DTM Bonding Primer.
 3. First and Second Coat: DTM Acrylic Semi-Gloss Enamel. (30-40 units @ 60°)
 - a. Moore: HP29 Ultra Spec HP DTM Acrylic Semi-Gloss.
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PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- b. PPG: 90-1210 Pitt-Tech Int/Ext Semi-Gloss DTM Industrial Enamel.
- c. S-W: B66W1150 Series Pro Industrial DTM Acrylic Semi-Gloss Coating.
- 4. First and Second Coat: DTM Acrylic Satin Enamel. Provide for hollow metal steel doors and frames. (15-25 units @ 60°)
 - a. Moore: HP25 Ultra Spec HP DTM Acrylic Low Lustre.
 - b. PPG: 90-1110 Pitt-Tech Int/Ext Satin DTM Industrial Enamel.
 - c. S-W: B66W1250 Series Pro Industrial DTM. Acrylic Eg-Shel.
- I. Zinc-Coated Metal: Semi-Gloss Direct to Metal ("DTM") Acrylic Enamel Finish: 2 Coats over primer, with min. total DFT of 2.5 mils.
 - 1. Prime Coat: Lead-free, acrylic base interior galvanized metal primer, premium grade.
 - a. Moore: HP04 Ultra Spec HP Acrylic Metal Primer.
 - b. PPG: 90-712 Pitt-Tech Int/Ext Primer/Finish Industrial Enamel.
 - c. S-W: B66W1150 Series Pro Industrial DTM Acrylic Semi-Gloss Coating.
 - 2. First and Second Coats: DTM Acrylic Semi-Gloss Enamel. Same as for ferrous metal.
- J. Green Screen PAint: Vinyl Acrylic, in chroma key green flat matte finish, applied per manufacturer's specification
 - 1. Bonding Primer: Prepare surface and apply one to two coats of primer complying with the manufacturer;s written intructions
 - a. Rosco Tough Prime
 - b. Pro Cyc Grey Bonding Primer
 - c. Muralo Latex Enamel Undercoat MO563
 - 2. Finish Coat: Hand roll paint two to three coats complying with manufacturer's written instructions, Allowing 2-3 hours dry time between coats
 - a. Rosco Video Paint Chroma Key Green 5711
 - b. Pro Cyc Virtual Green Chroma Key
 - c. Muralo Vogue Deep Colors Chroma Key Green
 - 3. Do not dilute

END OF SECTION 099100

**SECTION 101100
VISUAL DISPLAY UNITS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI A135.4 - Basic Hardboard.
- B. ANSI A208.1 - American National Standard for Particleboard.
- C. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.02 SUBMITTALS

- A. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, tackboard, tackboard surface covering, trim, and accessories.
- B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- C. Samples: Color charts for selection of color and texture of porcelain enamel steel markerboard, tackboard, tackboard surface covering, and trim.
- D. Test Reports: Show compliance to specified surface burning characteristics requirements.
- E. Maintenance Data: Include data on regular cleaning, stain removal.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Factory-fabricate visual display units and deliver as fully assembled units to greatest extent possible.
- B. Deliver and store visual display units with protective packaging. Do not remove protective covers until ready to install.
- C. Store visual display units in a dry, enclosed space. Do not install until installation spaces are enclosed and conditioned at occupancy conditions.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide fifty year warranty for markerboard porcelain face surface to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

- A. Porcelain Enamel Steel Markerboards: Magnetic, porcelain-enamel steel face sheet bonded to manufacturer's standard core. Provide with foil backer where mounted to exterior walls.
 - 1. Color: White.
 - 2. Height: 48 inches, unless otherwise indicated on Drawings.
 - 3. Length: As indicated on Drawings.
 - 4. Frame: Extruded aluminum, with concealed fasteners.
 - 5. Frame Finish: Anodized, natural.
 - 6. Accessories: Provide marker tray and map rail.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

7. Special Markings: Provide markerboards with the following integral markings at locations indicated. Markings shall be factory-painted or fused to surface of porcelain enamel.
 - a. Music staff lines.
 8. Products:
 - a. AARCO Products, Inc.
 - b. ASI Visual Display Products.
 - c. Bangor Cork Company, Inc.
 - d. Claridge Products and Equipment, Inc.
 - e. Ghent; a GMI Company.
 - f. Marsh Industries, Inc; Visual Products Group.
 - g. MooreCo, Inc.
 - h. Nelson Adams NACO.
 - i. Platinum Visual Systems.
 - j. Polyvision Corporation.
 - B. Tackboards: Fine-grained, homogeneous natural cork.
 1. Cork Thickness: 1/8 inch.
 2. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
 3. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 4. Height: 48 inches, unless otherwise indicated on Drawings.
 5. Lengths: As indicated on Drawings.
 6. Frame: Extruded aluminum, with concealed fasteners.
 7. Frame Profile: As indicated on drawings.
 8. Frame Finish: Anodized, natural.
 9. Products:
 - a. AARCO Products, Inc.
 - b. ASI Visual Display Products.
 - c. Bangor Cork Company, Inc.
 - d. Claridge Products and Equipment, Inc.
 - e. Ghent; a GMI Company.
 - f. Marsh Industries, Inc; Visual Products Group.
 - g. MooreCo, Inc.
 - h. Nelson Adams NACO.
 - i. Platinum Visual Systems.
 - j. Polyvision Corporation.
 - C. Tackstrips: Fine-grained, homogeneous natural cork.
 1. Cork Thickness: 1/8 inch.
 2. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
 3. Height: 1 inch.
 4. Length: As indicated on drawings. Where indicated to be installed over markerboard, match length of markerboard.
 5. Frame Profile: Manufacturer's standard.
 6. Frame Finish: Anodized, natural.
-

2.02 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Natural Cork: Natural ground cork, homogeneous and self-healing, laminated to manufacturer's standard backer with no additional resin or plastic additive.
- C. Burlap: Tightly woven, flame retardant treated.
- D. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).
- E. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- F. Fiber Board: ASTM C208, cellulosic fiber board.
- G. Foil Backing: Aluminum foil sheet, 0.005 inch thick. Provide foil backing on units indicated to be mounted on exterior walls.
- H. Adhesives: As recommended by manufacturer.

2.03 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- C. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.
- D. Mounting Brackets: Concealed.
- E. Mounting Accessories and Fasteners: Provide concealed Z-clips and hangers, and stainless steel screws or anchors for mechanical attachment of visual display units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of marker tray at 36 inches above finished floor.
 - 1. Mount continuous tackstrip directly above each porcelain markerboard in all classrooms.
- C. Secure units level and plumb.
- D. Mechanical Fastening: Install all visual display units for secure attachment with manufacturer's recommended concealed clips, hangers, and mechanical fasteners. Installation with adhesive is not acceptable.

- E. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.04 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 101100

**SECTION 101200
DISPLAY CASES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

1.02 SUBMITTALS

- A. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.
- B. Shop Drawings: Submit complete installation details. Include dimensioned elevations.
- C. Selection Samples: Submit color charts indicating manufacturer's full range of available options for tackable fabric panels.
- D. Verification Samples: Submit physical samples, manufacturer's standard size, of each selected color of tackable fabric material, and of trim material, to illustrate finish, color, and texture.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing factory-fabricated display cases as specified in this section.
- B. Installer Qualifications: Installation crew directly employed by manufacturer of products, or a company approved by manufacturer for installation of specified products.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver display cases and materials to the Project site with manufacturer's protective crate covering and do not open until ready for use.
- B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

1.05 FIELD CONDITIONS

- A. Field Measurements: Verify field measurements for recessed application for display cases before preparation of shop drawings and before fabrication to ensure proper installation.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship; beginning at the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 DISPLAY CASES

- A. Manufacturers:
 - 1. Basis-of-Design: The Tablet & Ticket Co.
 - 2. Claridge Products and Equipment, Inc.
 - 3. Platinum Visual Systems.
 - 4. Poblocki Sign Company, LLC.
- B. General: Provide only factory-fabricated and factory-assembled display cases. Display cases that are "stick-built" at the Project site or that are shipped disassembled for assembly on site are not acceptable.
 - 1. Provide welded aluminum frames with tight mitered joints. Comply with AWS D1.2/D1.2M for welding aluminum. Clean and finish exposed welds to remove flux and blend surfaces smooth so that welded surface matches adjacent surface.
 - 2. Fabricate display cases with no visible fasteners.
- C. Recessed Display Case: Factory-fabricated aluminum-framed display case with adjustable glass shelves, finished interior, and aluminum trim on face to cover edge of recessed opening.
 - 1. Basis-of-Design Product: The Tablet & Ticket Co.; 900DC Series.
 - 2. Dimensions: As indicated on Drawings.
 - 3. Components:
 - a. Glazed Doors: Sliding.
 - 1) Number of Doors: One pair.
 - b. Side, Top, and Bottom Panels: stainless steel framing.
 - c. Back Panel: Tackable fabric over cork.
 - d. Top Panel: stainless steel framing.
 - e. Bottom Panel: stainless steel framing.
 - f. Lighting: LED.

2.02 COMPONENTS

- A. Face Frame Trim for Recessed Installation: 2 inch by 2 inch flat face dimension extruded aluminum capping angles; mitered with corner clips and mechanical fasteners.
- B. Glazed Sliding Doors:
 - 1. 3/8 inch clear tempered glass with plastic finger pulls.
 - 2. Door track: Extruded aluminum glass shoe with bottom rollers and top plastic guide.
 - 3. Lock: Glass door cylinder lock.
- C. Glass Shelves:
 - 1. 3/8 inch clear tempered glass with flat-polished edges.
 - 2. Shelf Depth: 12 inches.
 - 3. Shelves per Unit: As indicated.
- D. Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
 - 1. Standards Mounting: Recess-mounted into back panel.
 - 2. Face Width: 5/8 inch.
 - 3. Material: Minimum 16 gauge, 0.0598 inch sheet steel.
 - 4. Standard Lengths: Extend all standards full height of display cases.

5. Brackets: Boltless with lip front; minimum 16 gauge, 0.0598 inch sheet steel, reinforced, locking into slots; size to suit shelves; same finish as standards.
- E. Tackable Back Panel: Fabric laminated to cork on hardboard.
 1. Cork Thickness: 1/4 inch.
 2. Fabric: Vinyl fabric; minimum fabric weight: 13 oz/sq yd.
 3. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- F. Lighting: Manufacturer's standard LED light fixture housed at top of case with louvered aluminum access door with keyed lock.
 1. Surface Mounted: Under cabinet type fixture.
 2. Controls: On/Off using switch mounted on display case.

2.03 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.
 1. Finish: Factory anodized; AAMA 611: Clear anodized.
- B. Heat-Strengthened and Fully Tempered Glass: ASTM C1048, Kind FT.
- C. Fasteners: Provide screws, bolts, and other fasteners as recommended by manufacturer for substrates indicated, and in sizes and lengths required for secure attachment of display case product to substrate.
 1. For fastening to masonry substrates, provide stainless steel or galvanized steel fasteners.

PART 3 EXECUTION

3.01 EXAMINATION & PREPARATION

- A. Examination: Verify that rough openings match field measurements and that rough openings and conditions are acceptable for product installation.
- B. Verify that electrical conduit, wiring, and other work that will be concealed by display case is complete and ready for installation.
- C. Provide blocking, grounds, and shims as required for display cases to be mounted securely, plumb and level, within rough openings.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate fastening devices to secure cases securely to sides of rough opening.
 1. Locate at manufacturer's required spacing, but not more than 16 inches o.c.
 2. Fasteners shall be concealed in the final installation.
- C. Install recessed display cases plumb and level in wall openings.
- D. Refer to drawings for display case mounting heights.
- E. Provide mitered and wrapped hairline joints for all trims.
- F. Coordinate with electrical installer to ensure lighting is properly connected and operational.

3.03 ADJUSTING AND CLEANING

- A. Verify that all accessories are installed as detailed for each unit.
- B. Restore and touch up damaged or worn areas of factory finishes.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- C. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer's recommendations leaving units ready for use.

END OF SECTION 101200

**SECTION 101400
SIGNAGE**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - 2010 ADA Standards for Accessible Design.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Allowance: Interior and exterior panel signage shall be covered by allowance; refer to Section 012100 - Allowances.
- B. Pre-Fabrication Meeting: The signage contractor shall meet with representatives of the Owner to develop a Signage Schedule, including signage style and layout, individual sign locations, including locations of code required signage and wayfinding signage, and final room naming and numbering. The Architect will provide the graphics contractor with reproducible floor plan drawings for use in determining sign locations.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule (After Pre-Fabrication Meeting): Submit schedule with 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. Submit for approval by Owner through Architect prior to fabrication.
- C. Selection Samples: Where colors are not specified, submit color selection charts or chips for each type of signage.
- D. Verification Samples: Submit samples, manufacturer's standard size, showing selected colors for each type of signage.

1.04 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.

1.05 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
 - 1. Sign Type: Flat signs with engraved panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Toilet room signage shall include pictograms and international symbol of accessibility.

2.02 PANEL SIGNAGE TYPES

- A. General: Interior and exterior panel signage shall be provided via lump-sum allowance; refer to Division 1 Section "Allowances."
 - B. Manufacturers:
 - 1. Allen Industries Architectural Signage.
 - 2. APCO Graphics, Inc.
 - 3. ASI-Modulex, Inc.
 - 4. Best Sign Systems, Inc.
 - 5. Gemini Incorporated.
 - 6. Innerface Sign Systems, Inc.
 - 7. InPro Corporation.
 - 8. Matthews International Corporation, Bronze Division.
 - 9. Mohawk Sign Systems.
 - 10. Nelson-Harkins Industries.
 - 11. Seton Identification Products.
 - 12. The Supersine Company.
 - 13. Welch Sign.
 - 14. Substitutions: See Section 016000 - Product Requirements.
 - C. Photopolymer Panel Signage: Signage media without frame.
 - 1. Signage Material: 0.032-inch water wash photopolymer face layer over a 0.160-inch phenolic or 0.120-inch PETG base layer.
 - 2. Edges: Square.
 - 3. Corners: Square.
 - 4. Wall Mounting of One-Sided Signs: Tape adhesive.
 - a. For signs mounted to glass, such as at door sidelights, provide a rear cover plate so the backside of sign will not be visible through the glass.
 - 5. Tactile Signage: Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - D. Aluminum Panel Signage: Fabricate of minimum 0.063-inch aluminum sheet, without frame, with baked enamel finish. Wall mount with stainless steel fasteners in each corner. Not acceptable at locations requiring tactile signage.
 - E. Color and Font: Unless otherwise indicated, panel signage, font, and color shall be selected from manufacturer's full range.
-

- F. Code-Required Signage: In addition to the room signage, provide panel signage required by accessibility regulations and requirements of authorities having jurisdiction, including, but not limited to, the following:
1. Tactile exit signs, stairway identification signs, room maximum capacity signs, elevator signs, and accessible space signs.
 2. Refer to Division 26 and Electrical Drawings for illuminated exit signs.

2.03 PLAQUES

- A. Manufacturers:
1. Advance Corporation; Braille-Tac Division.
 2. A.R.K. Ramos.
 3. Gemini Incorporated.
 4. Matthews International Corporation, Bronze Division.
 5. Metal Arts; Division of L&H Manufacturing Co.
 6. Mills Manufacturing Company.
 7. Nelson-Harkins Industries.
 8. The Southwell Company.
 9. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Plaques:
1. Metal: Bronze casting.
 2. Size: For bid purposes assume one 36 inch by 24 inch plaque, with a 6 inch diameter graphic logo / county seal (image to be provided by Owner) and raised text. Confirm final size and desired information, text, and typeface, with Owner.
 3. Surface Finish: Brushed, satin.
 4. Painted Background Color: As selected by Architect from manufacturer's standard background colors.
 5. Protective Coating: Manufacturer's standard clear coating.
 6. Mounting: Stud mounted, with concealed studs.

2.04 DIMENSIONAL LETTERS

- A. Manufacturers:
1. A.R.K. Ramos.
 2. ASI-Modulex, Inc.
 3. Charleston Industries, Inc.
 4. Gemini Incorporated.
 5. Innerface Sign Systems, Inc.
 6. Matthews International Corporation, Bronze Division.
 7. Metal Arts; Division of L&H Manufacturing Co.
 8. Mills Manufacturing Company.
 9. Mohawk Sign Systems.
 10. Superior Signs.
 11. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Letters:
1. Metal: Aluminum casting.
 2. Letter Thickness: As indicated on drawings; if not indicated, provide as follows:
 - a. 6 inches high or less: 1/2 inch thick.

- b. 7- to 11-inches high: 1 inch thick.
- c. 12- to 17-inches high: 1-1/2 inches thick.
- d. 18 inches high or more: 2 inches thick.
- 3. Letter Height: As indicated on drawings.
- 4. Text and Typeface: As indicated; where not indicated, as selected by Architect from manufacturer's full range of fonts.
- 5. Finish: Painted; color as selected by Architect from manufacturer's full range.
- 6. Mounting: Fabricate dimensional lettering for the following mounting types:
 - a. Projected Wall Mounted: Cast studs into the back of each letter for wall mounting at location indicated. Studs shall be sized to extend through cladding and fasten to structural substrate. Provide for a 1/2-inch gap between back of letter and face of cladding. Do not mount directly flush to wall surface.

2.05 ACCESSORIES

- A. Concealed Screws: Stainless steel, or other non-corroding metal.
- B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

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.
 - 1. Room Signs: Mount on latch side, with a clear space of 18 inches by 18 inches beyond the door swing arc, centered on the tactile characters. At double doors, mount to the right of right-hand leaf or on nearest adjacent wall. Mount at height that is compliant with ADA Standards.
- D. Mounting:
 - 1. Projected Wall Mounted: Cast studs into the back of each letter for wall mounting at location indicated. Studs shall be sized to extend through cladding and fasten to structural substrate. Provide for a 1/2-inch gap between back of letter and face of cladding. Do not mount directly flush to wall surface.
- E. Mounting, Plaques:
 - 1. Mount plaques with manufacturer's standard concealed stud method; with anchors recommended specifically for wall/partition substrate structure indicated. Mount plaques flush to wall surface with no gap behind plaques.
- F. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 101400

**SECTION 102113.19
PLASTIC TOILET COMPARTMENTS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.
- B. {RSTEMP#1857}NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth{CH#67785}.

1.02 SUBMITTALS

- A. Product Data: Provide data on panel construction, hardware, and accessories.
 - 1. Provide data for wall anchors for attachment of wall brackets.
 - 2. Provide data substantiating that door latch product complies with accessibility standards.
 - 3. Provide data indicating NFPA 286 testing and compliance.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
 - 1. Include locations of plumbing fixtures and floor drains.
 - 2. Include accessible and ambulatory stalls, including stall and door clearances.
- C. Selection Samples: Submit color charts indicating manufacturer's full range of colors. Color charts shall indicate which colors are NFPA 286 compliant.
- D. Verification Samples: Submit manufacturer's physical samples of each selected color.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 15 year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. ASI Accurate Partitions.
 - 2. ASI Global Partitions.
 - 3. General Partitions Mfg. Corp.
 - 4. Scranton Products.

2.02 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide HDPE panels tested per {RS#1857} and shown to meet the following criteria:
 - 1. During the 40 kW exposure, flames shall not spread to the ceiling.

2. During the 160 kW exposure:
 - a. Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
 - b. Flashover, as defined in NFPA 285, shall not occur.
3. The peak rate of heat release throughout the {RS#1857} test shall not exceed 800 kW.
4. The total smoke released throughout the {RS#1857} test shall not exceed 1,000 m².

2.03 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 1. Color: As selected by Architect from manufacturer's full range of NFPA 286 compliant colors.
 2. Doors:
 - a. Thickness: 1 inch.
 - b. Width: 24 inch.
 - c. Width for Handicapped Use: 36 inch, out-swinging.
 - d. Height: 55 inch.
 3. Panels:
 - a. Thickness: 1 inch.
 - b. Height: 55 inch.
 4. Pilasters:
 - a. Thickness: 1 inch.
 - b. Width: As required to fit space; minimum 3 inch.
 5. Urinal Screens: Wall mount (no post/pilaster). Match panel material and thickness; 42 inch height, and depth as indicated on Drawings.

2.04 ACCESSORIES

- A. Material for Hardware and Accessories: Provide stainless steel or anodized aluminum as indicated, with satin finish. Where not indicated, Contractor may provide either material at its option. Zamac is not acceptable.
 - B. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
 - C. Head Rails: Extruded aluminum, anti-grip profile.
 1. Size: Manufacturer's standard size.
 - D. Wall and Pilaster Brackets: Anodized aluminum, minimum 0.125 inch wall thickness; continuous type; approximately 1 inch shorter than panel height.
 - E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
 - F. Hinges: Coordinate hinges with latch and keeper to provide emergency access.
 1. Continuous-Type (Piano) Hinges (Heavy-Duty): Adjustable for door close positioning, with 1/8-inch pin of matching material. Provide spring-loaded self-closing type with five (5) adjustable internal springs at accessible, barrier-free, and outswinging doors, and provide gravity type with cam knuckles that can be adjusted to hold doors open at inswinging doors. Provide hinge length 1 inch shorter than door height.
 - G. Door Hardware: Coordinate latch and keeper with hinges to provide emergency access.
 1. Door Latch (Heavy-Duty): Slide type, cast stainless steel with minimum 0.150-inch thickness slide bar, latch knob welded to slide bar.
-

2. Door Strike and Keeper with Rubber Bumper (Heavy-Duty): Cast stainless steel, minimum 2.5-inch high with minimum 0.125-inch wall thickness, with integral rubber bumper. Mount on pilaster in alignment with door latch.
 3. Provide a door pull on both sides of door for accessible and ambulatory compartments, in compliance with the ADA Standards for Accessible Design.
- H. Coat Hook with Rubber Bumper: One per compartment, mounted centered on inside face of door.
- I. Rubber Door Bumper: Mount in upper corner of latch side of outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 102113.19

**SECTION 102123
CUBICLE CURTAINS AND TRACK**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.02 SUBMITTALS

- A. Product Data: Provide data for curtain fabric characteristics and for curtain track.
 - 1. Fire Test Data: Provide data indicating fabric is identical to that which has passed NFPA 701 and is inherently and permanently flame resistant.
- B. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes. Include above ceiling blocking.
- C. Selection Samples: Manufacturer's pattern and color charts for curtain and mesh fabrics.
- D. Verification Samples: Submit 12 by 12 inch sample patches of curtain and mesh cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.
- E. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

PART 2 PRODUCTS

2.01 TRACKS AND TRACK COMPONENTS

- A. Tracks: Extruded aluminum sections; minimum 0.050-inch aluminum thickness; fabricated in one piece per track run, to greatest extent possible.
 - 1. Profile: Channel, nominal 1-1/4 inches wide by 3/4 inch high.
 - 2. Mounting: Surface.
 - 3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
 - 4. Track End Stop: To fit track section.
 - 5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
 - 6. Finish on Exposed Surfaces: Clear anodized.
 - 7. Products:
 - a. Construction Specialties; Traditional 6062 Track + 1062N carrier with ball chain/hook.
 - b. Inpro; Clickeze CE5000 track + CE5038 carrier with ball chain/hook.
 - c. Imperial Fastener Co.; IFC-98 track + IFC-100 carrier with ball chain/hook.
 - d. Salsbury Industries; 19100 series track + 19103 carrier with ball chain/hook.
 - B. Curtain Carriers: Nylon rollers and 6 inch long beaded chain with aluminum hooks, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.
 - C. Installation Accessories: Types required for specified mounting method and substrate conditions.
 - 1. Provide stainless steel fasteners for exposed locations, and hot-dip galvanized fasteners for concealed locations.
-

2.02 CURTAINS

- A. Cubicle Curtains:
 - 1. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
 - a. Fabric shall include identification markings from testing agency.
 - 2. Material: Close weave polyester; anti-bacterial, stain resistant, self deodorizing, sanitized, and preshrunk.
 - 3. Color/Pattern: As selected by Architect from manufacturer's full range.
 - 4. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, to be selected by Architect from manufacturer's full range.
 - 5. Attachment of Curtain Fabric to Open Mesh Cloth: Manufacturer's standard sewn seam.
 - 6. Products:
 - a. ArcCom, Inc.
 - b. INVISTA.
 - c. Maharam; Canto (Basis of Design)
 - d. Momentum Textiles and Wallcoverings.
 - e. Trevira.
- B. Curtain Fabrication:
 - 1. Width of curtain to be 10 percent wider than track length.
 - 2. Length of curtain to end 15 inches above finished floor.
 - 3. Pattern match fabric with vertical seams.
 - 4. Include open mesh cloth at top 20 inches of curtain for room air circulation, attached to curtain as specified above.
 - 5. Curtain Heading: Web reinforced band of open mesh cloth with metal grommet holes for carriers spaced 6 inches on center.
 - 6. Seams and Hems: Manufacturer's standard fabrication method for securely sewn and finished seams and hems.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.
- B. Verify that field measurements are as indicated.

3.02 INSTALLATION

- A. Install curtain track to be secure, rigid, and true to ceiling line, per manufacturer's installation instructions.
- B. Secure track to ceiling system.
 - 1. Secure with mechanical fasteners to ceiling grids, not to exceed manufacturer's recommended spacing.
- C. Install end caps and stop devices, and provide splices and connector accessories as required for layout indicated.
- D. Install curtains on carriers ensuring smooth operation.

END OF SECTION 102123

**SECTION 102239
FOLDING PANEL PARTITIONS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- C. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- F. ASTM E413 - Classification for Rating Sound Insulation.
- G. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions.
- H. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.
- I. NEMA MG 1 - Motors and Generators.
- J. NFPA 70 - National Electrical Code.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.

1.03 SUBMITTALS

- A. Product Data: Provide data on partition materials, operation, hardware and accessories, and colors and finishes available.
- B. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, stacking depth, and electrical loads and calculations.
- D. Samples for Selection: Submit manufacturer's color charts for selection of colors.
- E. Samples for Verification: Submit physical samples of surface finish, manufacturer's standard size, illustrating quality, colors selected, texture, and weight.
- F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- G. Installer's qualification statement.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified, with personnel trained and approved by manufacturer for installation of specified products.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until installation.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Folding Panel Partitions - Horizontal Opening:
 - 1. Kwik-Wall Company; 3030 - Paired Panels.
 - 2. Moderco, Inc; 800 Series Model 842.
 - 3. Modernfold, a DORMA Group Company; Acousti-Seal Legacy. (Basis of Design)

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING, MOTOR OPERATED

- A. Folding Panel Partitions: Side opening; continuous hinged panels; center stacking; motor operated.
 - B. Panel Construction:
 - 1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; with corner support and cross-bracing reinforcement; welded construction, with acoustical insulation fill.
 - 2. Substrate: Gypsum board.
 - 3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness for performance requirements indicated.
 - a. Provide all-welded, all-steel construction of panel, with facing sheet welded to specified framing. Riveted connections will not be accepted. Horizontal or vertical spliced frame members or facings will not be accepted.
 - 4. Hinges: Manufacturer's standard full leaf butt hinges; with steel mounting bracket welded to frame.
 - 5. Panel Properties:
 - a. Thickness With Finish: 3 inches.
 - b. Width: Manufacturer's standard panel widths.
 - c. Weight: 9.5 lb/sq ft, maximum.
 - C. Panel Finishes:
 - 1. Facing: Vinyl coated fabric.
 - 2. Trim/Edges: Provide manufacturer's trimless vertical edges/astragals, with a minimal grooved appearance between panel joints.
 - D. Panel Seals:
-

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
 2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor seals, and above track to structure acoustic seal.
 - a. Top Seal: Continuous contact fixed resilient seal or sweeps.
 - b. Bottom Seal: Automatically retracts and extends due to movement of partition. Retraction operating range of 1-1/2 or 2 inches.
- E. Suspension System:
1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors.
 2. Carriers: Steel, ball bearing wheels on trolley carrier at top of every panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
1. Acoustic Performance:
 - a. Sound Transmission Class (STC): 52, minimum; calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Operation:
1. Electric Operator: 12 inches per second traveling speed; adjustable friction clutch brake actuated by solenoid controlled motor starter; enclosed limit switch; enclosed magnetic reversing starter.
 - a. Motor: NEMA MG 1.
 2. Control Station: Two standard keyed, three button OPEN-STOP-CLOSE type; 24 volt circuit; surface mounted.
 - a. Key switch prepared for mortise lock cylinder.
 - b. Key switches alike.
 3. Safety Features:
 - a. Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
 - b. Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
 - c. Pocket Door Interlock: Mechanism to prevent operation of panels unless storage pocket doors are fully open.
 4. Electrical Requirements:
 - a. 208 volts, three phase, 1 HP, 4.5 FLA.
 - b. Conduit and Outlet Boxes: Concealed type in accordance with Section 260533.
 - c. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated on Electrical Drawings. Enclose terminal lugs in terminal box sized to NFPA 70.
 - d. Disconnect Switch: Factory mount disconnect switch in control panel.
- H. Accessories:
1. Pocket Enclosures: Door, frame, and trim to match adjacent panels; non-acoustical.
 2. Acoustic Sealant: As recommended by partition manufacturer.
-

3. Windows: Window cutouts with 1/4 inch clear tempered glazing complying with ASTM C1036 and finished with manufacturer's standard aluminum trim.

2.03 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING, MANUALLY OPERATED

- A. Folding Panel Partitions: Side opening; continuous hinged panels; center stacking; manually operated.
- B. Panel Construction:
 1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; with corner support and cross-bracing reinforcement; welded construction, with acoustical insulation fill.
 2. Substrate: Gypsum board.
 3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness for performance requirements indicated.
 - a. Provide all-welded, all-steel construction of panel, with facing sheet welded to specified framing. Riveted connections will not be accepted. Horizontal or vertical spliced frame members or facings will not be accepted.
 4. Hinges: Manufacturer's standard full leaf butt hinges; with steel mounting bracket welded to frame.
 5. Panel Properties:
 - a. Thickness With Finish: 3 inches.
 - b. Width: Manufacturer's standard panel widths.
 - c. Weight: 9.5 lb/sq ft, maximum.
- C. Panel Finishes:
 1. Facing: Vinyl coated fabric.
 2. Trim/Edges: Provide manufacturer's trimless vertical edges/astragals, with a minimal grooved appearance between panel joints.
- D. Panel Seals:
 1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
 2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor seals, and above track to structure acoustic seal.
 - a. Top Seal: Continuous contact fixed resilient seal or sweeps.
 - b. Bottom Seal: Automatically retracts and extends due to movement of partition. Retraction operating range of 1-1/2 or 2 inches.
- E. Suspension System:
 1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors.
 2. Carriers: Steel, ball bearing wheels on trolley carrier at top of every panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
 1. Acoustic Performance:
 - a. Sound Transmission Class (STC): 52, minimum; calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Accessories:
1. Pocket Enclosures: Door, frame, and trim to match adjacent panels; non-acoustical.
 2. Acoustic Sealant: As recommended by partition manufacturer.

2.04 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Standard Gypsum Board: ASTM C1396/C1396M,, maximum permissible length; ends square cut, square edges.
- C. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.
- D. Acoustic Insulation: Manufacturer's standard type and thickness as required for acoustic performance indicated.
 1. Type: As required for acoustic performance indicated.
 2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that overhead support beam and supporting structure is properly sized and installed in accordance with manufacturer's requirements.
- C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
- D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
- E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.
- C. Lubricate moving components.
- D. Install acoustic sealant to achieve required acoustic performance.

3.03 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

- A. Clean finish surfaces and partition accessories.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation and maintenance of partition to Owner's personnel and identify potential operational problems.

END OF SECTION 102239

**SECTION 102600
WALL AND DOOR PROTECTION**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.

1.02 SUBMITTALS

- A. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.
- B. Shop Drawings: Include plans, elevation, sections, and attachment details.
- C. Selection Samples: Provide manufacturer's color charts for each product and material requiring color selection.
- D. Verification Samples: Submit physical samples, manufacturer's standard size, for each selected color.
 - 1. Submit physical samples of manufacturer's product with digitally printed graphic for approval.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures or internal connection failures.
 - b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Babcock-Davis.
 - 2. Construction Specialties, Inc.
 - 3. Inpro.
 - 4. Koroseal Interior Products.
 - 5. Nystrom, Inc.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Impact Resistant Wall Covering with digital graphics:
 - 1. Construction Specialties, Inc; Acrovyn by Design High Impact Wallcovering (Basis of Design).
 - 2. Inpro; Aspex Printed Wall Protection.
 - 3. Koroseal Interior Products, LLC; Fusion Digitally Printed Protective Wallcovering.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Basis-of-Design Product: Construction Specialties; Acrovyn VA Series.
 - 2. Material: Polyethylene terephthalate (PET or PETG); PVC-free.
 - 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 4. Width of Wings: 1-1/2 inches.
 - 5. Corner: Square.
 - 6. Color: To be selected by Architect from manufacturer's full range.
 - 7. Length: One piece, 6 feet (72 inches) in length.
- B. Impact Resistant Wall Covering:
 - 1. Basis-of-Design: Construction Specialties; Acrovyn by Design High Impact Wall Covering.
 - 2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
 - 3. Thickness: 0.040 inch.
 - 4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 5. Color: Custom digital graphic matching Architect's sample.
 - a. Include \$500 allowance for licensing and digital image formatting.
 - b. Digital image licensor shall provide a digital file formatted in accordance with wall protection manufacturer's digital requirements.
 - c. Coordinate Basis of Design image with Architect after bidding.
 - 6. Accessories: Provide manufacturer's standard color-matched trim and moldings.
 - a. Inside Corner Trim: Standard angle

- b. Outside Corner Trim: Standard angle.
- 7. Mounting: Adhesive.
- C. Adhesives and Primers: As recommended by manufacturer.

2.04 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

2.05 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Provide corner guards at all outside corners of gypsum board partitions.
- C. Position corner guard with bottom of corner guard immediately above top of wall base.
- D. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
 - 1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - 2. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
 - 3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
 - 4. Use a roller to ensure maximum contact with adhesive.
 - 5. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
-

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 102600

**SECTION 102800
TOILET AND BATH ACCESSORIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.03 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Maintenance Data: For each type of accessory, to include in maintenance manual per Section 017800 - Closeout Submittals. Include list of replacement parts and service recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: 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.
- B. Keys: Provide 6 master/universal keys, minimum, to Owner.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

- F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
 - 1. Provide mechanical attachment of all accessories. Use of adhesive or double-side tape is not acceptable.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 TOILET ACCESSORIES SCHEDULE, GENERAL

- A. General: The following products make reference to the designations indicated on the Toilet Accessories Schedule, Toilet Assemblies, and toilet room plans on the drawings; herein designated as "TA-x".

2.05 COMMERCIAL TOILET AND BATH ACCESSORIES

- A. Grab Bars (TA-A, B, C, & N): Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) American Specialties, Inc.; 3700 Series.
 - 2) Bobrick Washroom Equipment, Inc.; B-5806 Series.
 - 3) Bradley Corporation; 832 Series.
 - B. Toilet Paper Dispenser (TA-D): Shall be furnished by Owner for installation by Contractor.
 - C. Sanitary Napkin Disposal Unit (TA-E): Stainless steel, surface-mounted, self-closing door, with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Products:
 - a. American Specialties, Inc; Model 20852.
 - b. Bobrick Washroom Equipment, Inc.; Model B-270 Contura.
 - c. Bradley Corporation; Model 4781-11.
 - D. Soap Dispenser (TA-F): Shall be furnished by Owner for installation by Contractor.
 - E. Mirrors (TA-G): Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
 - 1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 - 2. Size: As indicated on drawings.
 - 3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 4. Products:
 - a. American Specialties, Inc; 0600 A Series.
 - b. Bobrick Washroom Equipment, Inc.; Model B-290.
 - c. Bradley Corporation; Model 780.
 - F. Corner Grab Bar Assembly (TA-H): Stainless steel, smooth surface.
 - 1. Stainless-Steel Nominal Thickness: 0.05 inch.
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PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

2. Finish: Satin.
 3. Mounting: Concealed with manufacturer's standard flanges and anchors.
 4. Outside Diameter: 1-1/4 inches unless otherwise indicated.
 5. Configuration: Single "L" shaped shower grab bar.
 - a. Length (Control Wall): 32 to 34 inches from wall to centerline of return.
 - b. Length (Back Wall): Nominal 18 inches from wall to centerline of return. Limit leg length so as not to interfere with folding shower seat.
 6. Products:
 - a. American Specialties, Inc.; Model 3774.
 - b. Bobrick Washroom Equipment, Inc.; Model B-6861 (1-1/2 inches OD).
- G. Folding Shower Seat (TA-J): Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped seat.
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of manufacturer's standard color.
 2. Size: ADA Standards compliant; minimum 24 inches wide by 16 inches deep.
 3. Products:
 - a. American Specialties, Inc.; Model 8308-28.
 - b. Bobrick Washroom Equipment, Inc.; Model B-5193.
 - c. Bradley Corporation; Model 9562.
- H. Shower Curtain Rod (TA-L): Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
1. Products:
 - a. American Specialties, Inc; Model 1204.
 - b. Bobrick Washroom Equipment, Inc.; Model B-6047.
 - c. Bradley Corporation; Model 9539.
 2. Shower Curtain: Provide shower curtain with each shower curtain rod.
 - a. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - b. Size: Provide curtain width 6 inches wider than shower opening dimension for 36 inch showers, and 12 inches wider than shower opening dimension for 48 inch and larger showers. Provide curtain height sized to 2 inches less than curtain rod mounting height.
 - c. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - d. Color: White.
 - e. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- I. Paper Towel Dispenser (TA-Q): Shall be furnished by Owner for installation by Contractor.
- J. Folding Shower Seat (TA-V): Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, rectangular seat.
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of manufacturer's standard color.
 2. Size: ADA Standards compliant; minimum 24 inches wide by 16 inches deep.
 3. Products:
 - a. American Specialties, Inc.; Model 8308-28.
-

- b. Bobrick Washroom Equipment, Inc.; Model B-5193.
 - c. Bradley Corporation; Model 9562.
- K. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish. Provide one centered on interior face of door of all single-user toilet rooms and one adjacent to each shower, unless otherwise indicated on Drawings; verify final mounting locations with Architect in field.
- 1. Products (Double-Prong):
 - a. American Specialties, Inc.; Model 7345.
 - b. Bobrick Washroom Equipment, Inc.; Model B-7672.
 - c. Bradley Corporation; Model 9124.

2.06 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. Construction: 1/8 inch flexible PVC.
 - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - b. Microbial and Fungal Resistance: Comply with ASTM G21.
 - 4. Color: White.
 - 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
 - 6. Products:
 - a. Plumberex Specialty Products, Inc; Plumberex Trap Gear.
 - b. Truebro; IPS Corporation; Lav Guard 2.

2.07 ELECTRIC HAND DRYERS

- A. Electric Hand Dryers (TA-U): Traditional fan-in-case type, with downward fixed nozzle.
- 1. Operation: Automatic, sensor-operated on and off.
 - 2. Mounting: Surface mounted.
 - 3. Cover: Stainless steel with brushed finish.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 - b. Screened or shielded air intake.
 - c. Screen or shield to prevent access to motor/heater.
 - 4. Air Velocity: 18,000 linear feet per minute, minimum, at full power.
 - 5. Heater: 500 W, minimum, at full power.
 - 6. Fan/Heater Control: Field adjustable down to approximately half-speed with corresponding reduction in heat output.
 - 7. Total Wattage: 1400 W, maximum.
 - 8. Runtime: Field adjustable or automatic, up to 35 seconds.
 - 9. Air sanitizing and deodorizing without use of chemicals.
 - 10. Electric Hand Dryer Products:
 - a. Excel Dryer Inc; XLERATOR.
 - b. Mitsubishi Electric Trane HVAC US LLC; Jet Towel, Mini Type.
 - c. World Dryer Corporation; VERDEdri.
 - d. Substitutions: Section 016000 - Product Requirements.

2.08 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder (TA-T): 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
 - 4. Length: 36 inches.
 - 5. Products:
 - a. A&J Washroom Accessories, Inc.; Model UJ41B.
 - b. American Specialties, Inc; Model 1315-4.
 - c. Bobrick Washroom Equipment, Inc.; Model B-224 x 36.
 - d. Bradley Corporation; Model 9984.

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.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated on Drawings.

3.03 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

**SECTION 104400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide.
- B. NFPA 10 - Standard for Portable Fire Extinguishers.
- C. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

- A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and trim and door panel styles.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.03 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.
- B. Coordinate rough opening sizes to ensure cabinet locations meet ADA mounting requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers and Cabinets:
 - 1. Activar Construction Products Group, Inc. - JL Industries.
 - 2. Amerex Corporation.
 - 3. Ansul, a Tyco Business.
 - 4. Babcock-Davis.
 - 5. Badger Fire Protection.
 - 6. Buckeye Fire Equipment Company.
 - 7. Fire-End & Croker Corporation.
 - 8. Kidde, a unit of United Technologies Corp.
 - 9. Modern Metal Products; Div of Technico.
 - 10. Larsen's Manufacturing Co.
 - 11. MOON American.
 - 12. Nystrom, Inc.
 - 13. Oval Brand Fire Products.
 - 14. Potter-Roemer.
 - 15. Pyro-Chem, a Tyco Business.
 - 16. Strike First Corporation of America.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 1. Class: 4-A: 60-B:C.
 2. Size: 10 pound.
 3. Finish: Baked polyester powder coat, color as selected.
 4. Temperature range: Minus 40 degrees F to 120 degrees F.
- C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 1. Class: K type.
 2. Size: 1.6 gallons.
 3. Temperature range: Minus 20 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 1. Formed cold-rolled steel sheet; minimum 0.036 inch thick base metal.
 2. Available Products: One of the following, or comparable product by manufacturer from list above:
 - a. J.L. Industries/Activar; Ambassador 1017.
 - b. Larsen's Manufacturing Co.; Model 2409-6R.
 - c. Potter-Roemer; Model 1724.
- B. Cabinet Configuration: Semi-recessed type.
 1. Size to accommodate extinguisher(s) and accessories indicated.
 2. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
 3. Trim Type: One piece trim and door frame, returned to wall surface. Rolled edge trim; 2-1/2- to 3-inch depth as standard with manufacturer.
 4. Door Glazing Style: Vertical duo, configuration as standard with manufacturer.
- C. Door: Minimum 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.
- D. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Operating Hardware: Manufacturer's standard for cabinet type; continuous door hinge allowing 180 degree opening, with ADA-compliant door latch either surface mounted or flush inset into door panel, with cam or friction latch operation.
- G. Fabrication: Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- I. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated or baked-enamel finish.
 - B. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, pre-spaced lettering in accordance with authorities having jurisdiction (AHJ).
 1. Apply vertically to door of fire extinguisher cabinets, and apply to wall surface at bracket mounted extinguishers.
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2.05 EMERGENCY KEY ACCESS BOX

- A. Commercial Door Key Access Box: Provide fire department emergency key access box manufactured by The Knox Company; as required by local Fire Marshal. Provide Knox Box recessed mount 3200 Series, nominal 4 inches by 5 inches by 3-1/4 inches deep, with tamper switch and recessed mounting kit. Provide manufacturer's standard polyester powder coat finish in black color. No substitutions will be considered. Coordinate recessed installation with substrate construction, electrical connections as required for proper operation, and with requirements of local Fire Marshal. Contact Knox Company: www.knoxbox.com

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, no greater than 48 inches from finished floor to top of handle.
- C. Install mounting brackets at 44 inches above finish floor.
- D. Secure rigidly in place.
- E. Place extinguishers and accessories in cabinets and on wall brackets.
- F. Adjust cabinet doors after installation to ensure smooth operation.

3.03 PROTECTION AND CLEANING

- A. Protect fire extinguishers, fire extinguisher cabinets, and accessories from damage until Substantial Completion.
- B. Provide touchup to damaged finishes; replace items that cannot be satisfactorily repaired or refinished.

END OF SECTION 104400

**SECTION 105113
METAL LOCKERS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. 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.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate with Section 033000 - Cast-in-Place Concrete to provide 4-inch high concrete bases with embedded anchors or grounds as required for locker attachment.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.
- B. Shop Drawings: Indicate locker plan layout, numbering plan.
- C. Samples: Submit manufacturer's color charts illustrating full range of available colors.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2 year manufacturer warranty for materials and workmanship. Complete forms in Owner's name and register with manufacturer.
 - 1. Warranty shall cover failures including material and finish failure and faulty operation of latches, hinges, or other hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lockers:
 - 1. Art Metal Products; Standard KD.
 - 2. List Industries, Inc; Classic Line of Superior KD.
 - 3. Lyon Workspace Products; Standard Lockers.
 - 4. Penco Products, Inc; Vanguard.
 - 5. Republic Storage Systems Co; Standard.

2.02 LOCKER APPLICATIONS

- A. Wardrobe Lockers: Metal lockers, mounted to wall and concrete base.
 - 1. Width & Depth: 12 by 12 inches, or 15 by 15 inches, as indicated on Drawings.
 - 2. Height: 72 inches.

3. Configuration: Single tier or two-tier, as indicated on Drawings.
4. Fittings (Single Tier): Provide shelf, double-prong ceiling hook mounted to underside of shelf, and two single-prong wall hooks, one on each side wall.
5. Fittings (Two-Tier): Provide one double-prong ceiling hook and two single-prong wall hooks, one on each side wall.
6. Ventilation: Louvers at top and bottom of door panel.
7. Locking: Padlock hasps, for padlocks provided by Owner (Padlocks NIC).
8. Provide sloped top.

2.03 METAL LOCKERS

- A. Accessibility: Design units indicated on drawings as 'accessible' to comply with ICC A117.1 and ADA Standards.
 1. Quantity: Provide not less than one ADA-compliant locker for every 20 total; for each locker type (single-tier and two-tier). Locate ADA lockers at end of locker run with clear access space.
 2. Locate bottom shelf no lower than 15 inches above floor.
 3. Locate hooks, coat rods, and shelves no higher than 48 inches above floor.
 4. Provide ADA-compliant recessed handle and latch, no higher than 48 inches above floor.
 5. Provide 3" x 3" aluminum plate logo with the international symbol of accessibility on each ADA-compliant locker.
 - B. Locker Case Construction:
 1. Standard-Duty, Knocked Down Construction: Made of formed sheet steel; metal edges finished smooth without burrs; baked enamel or powder coat finished inside and out.
 - a. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
 - 1) Unperforated Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M and the following:
 - (a) Provide uncoated (cold-rolled) steel sheet except provide zinc-coated steel sheet for locker bottoms.
 - C. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 1. Where ends or sides are exposed, provide flush panel closures.
 2. Provide filler strips where indicated, securely attached to lockers.
 3. Color: To be selected by Architect. Manufacturer's standard neutral color is acceptable for locker interiors.
 - D. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
 1. Tops, Sides, and Shelves: 24 gauge, 0.0239 inch minimum.
 2. Backs: 24 gauge, 0.0239 inch minimum.
 3. Reinforced Bottoms: 24 gauge, 0.0239 inch minimum with channel edge; welded to frame panels, with manufacturer's standard stiffeners.
 - E. Doors and Frames: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
 1. Door and Frame Sheet Thickness: 16 gauge, 0.0598 inch, minimum.
 2. Form recess for operating handle and locking device.
 3. Form continuous integral door strike full height on vertical main frames.
-

- F. Latches and Door Handles: Manufacturer's standard.
 - 1. Latching: Manufacturer's standard for locking arrangement selected.
 - a. Multi-Point Lift Handle Gravity Latch: Pocket-mounted, provide two-point latching for two-tier locker doors and three-point latching for single-tier locker doors.
 - 1) Handle Pocket, Recess: Stainless steel flush-mounted cup recessed into face of door.
 - 2) Handle: Steel finger lift mechanism with exposed portion encased in molded plastic trigger.
 - (a) Padlock Eye: Integral with lift trigger, sized for use with 9/32 inch diameter padlock shackles.
 - 3) Latching Mechanism: Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.
 - 4) Provide resilient silencers secured to door stops for silent operation.
- G. Hinges: Heavy duty, 5- or 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.
- H. Sloped Top: 18 gauge, 0.0478 inch minimum, with closed ends.
- I. Filler Panels, End Closures and Trim: 18 gauge, 0.0478 inch, minimum.
- J. Number Plates: Provide oval shaped aluminum plates. Form numbers of block font style with ADA designation, in contrasting color.

2.04 LOCKER BENCHES

- A. Locker Benches: Stationary type; bench top of laminated birch; painted steel pedestals.
 - 1. Standard Benchtop Dimensions: 9-1/2 inches deep by 1-1/4 inches thick; lengths indicated on Drawings. Where not indicated, provide 8 foot long benches.
 - 2. Height: 17-1/2 inches to top of bench; at all benches.
 - 3. Accessibility: Where accessible benches are indicated, comply with ICC A117.1 and ADA Standards.
 - a. Accessible Bench Dimensions: 42 inches wide by 20 inches deep, minimum.
 - b. Where accessible bench is not indicated to be installed against a wall, provide unit with a backrest extending at minimum 18 inches above the bench top. Each backrest shall be mounted to bench with at least two mounting brackets.
 - 4. Pedestals: Tubular steel, with mounting flanges welded to each end; fixed to floor.
 - a. Pedestal Finish: Powder coat; match locker exterior finish color.
 - b. Fasteners: Provide with manufacturer's standard fasteners for securing benchtop to pedestals, and provide concrete expansion/wedge anchors for anchorage to floor slab. Provide all anchors with heads color-matched to pedestals.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors and grounds are properly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.

- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Bolt or rivet adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install fittings if not factory installed.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION 105113

**SECTION 105613
METAL STORAGE SHELVING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ANSI MH28.1 - Multi-Level Shelving Systems Utilizing Industrial Grade Steel Shelving.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
- B. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Four Post Shelving:
 - 1. Hallowell.
 - 2. List Industries, Inc.
 - 3. Montel.
 - 4. Penco Products, Inc.
 - 5. SpaceSaver Corporation.
 - 6. Tennsco Storage.
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 SHELVING - GENERAL

- A. General: All shelving shall comply with ANSI MH28.1.
- B. See drawings for layout and sizes.
- C. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 - 1. Provide hardware of type recommended by manufacturer for substrate.
 - 2. Wall Anchorage: Provide manufacturer's standard "Z" shape wall mount system, fabricated of two L-angles back to back, and fastened together with two nuts and bolts. Anchorage of post directly to wall is not acceptable. Prior to wall attachment, install foot plates at base of all posts and shim or adjust to achieve level and plumb installation.

2.03 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-shelf type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Unit Sizes:
 - a. 36 inches wide by 12 inches deep. (Penco basis-of-design: Model 1H7016)
 - b. 36 inches wide by 18 inches deep. (Penco basis-of-design: Model 1H7026)
 - 2. Shelf Capacity: 800 lb for 36 inch wide units.
 - 3. Adjustability of Shelving: Continuous along length of post (1 inch centers).
 - 4. Shelves per Unit: 6 shelves total; top, bottom, and 4 intermediate.
 - 5. Unit Height: 84 inches, nominal. (Penco basis-of-design is 87 inches high)
 - 6. Finish: Baked enamel, medium gloss.
 - 7. Color: To be selected by Architect from manufacturer's full range.
- B. Posts: Formed sheet members; perforations exposed on face of members are not acceptable.
 - 1. Metal Thickness: Manufacturer's standard for shelf quantity and loading requirements.
 - 2. Connecting Hardware: Manufacturer's standard.
 - 3. Post Bases: Flat steel foot plate, with manufacturer's recommended adjustable leveling device; pre-drilled for floor anchors.
- C. Bracing: Formed sheet members.
 - 1. Back Sway Bracing: Strap type; at back of each unit.
 - 2. Side Sway Bracing: Strap type; at each side of each unit.
 - 3. Strap Sway Bracing: Two straps crossed diagonally, of manufacturer's standard steel sheet thickness; welded, riveted, or bolted to uprights.
- D. Shelves: Formed sheet, finished on all surfaces, with slots for dividers.
 - 1. Metal Thickness: 18 gauge, 0.0478 inch.
 - 2. Shelf Edge Profile: Extending 3/4 inch, maximum, below top surface of shelf.
 - 3. Shelf Connection to Posts: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Verify that walls are suitable for shelving attachment.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
 - 1. Anchor to floor with floor anchors, secured through pre-drilled floor plates.
 - 2. Shim and adjust floor plates prior to installation of wall anchors.
 - 3. Anchor to wall with manufacturer's standard "Z" shape wall mount system.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 CLEANING

- A. Clean shelving and surrounding area after installation.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 105613

**SECTION 107500
FLAGPOLES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
- D. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles.

1.02 SUBMITTALS

- A. Product Data: Provide data on pole, accessories, and configurations.
- B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.
- C. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

- A. Designer Qualifications: Design flagpole assemblies, including foundations, under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flagpoles:
 - 1. American Flagpole & Flag Co.
 - 2. Baartol Co., Inc.
 - 3. Concord American Flagpole.
 - 4. Eagle Mountain Flag and Flagpole.
 - 5. Eder Flag Manufacturing Co., Inc.
 - 6. Morgan-Francis Flagpoles & Accessories
 - 7. Pole-Tech Co, Inc.
 - 8. Substitutions: See Section 016000 - Product Requirements.

2.02 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001.
 - 1. Material: Aluminum.
 - 2. Design: Cone tapered.

3. Mounting: Ground mounted type.
 4. Quantity and Nominal Heights: As indicated on Drawings; heights shall be measured from nominal ground elevation.
 5. Halyard: External type.
 - a. Provide two halyards at each flagpole.
 - b. Snap Hooks: Provide two snap hooks per halyard; fabricated of brass.
- B. Performance Requirements:
1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.03 POLE MATERIALS

- A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper.

2.04 ACCESSORIES

- A. Finial Ball: Aluminum, 6 inch diameter.
- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch size, aluminum with galvanized steel fastenings, one per halyard.
- D. Halyard: 5/16 inch diameter nylon, braided, white.

2.05 MOUNTING COMPONENTS

- A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth as indicated on Drawings.

2.06 FINISHING

- A. Metal Surfaces in Contact With Concrete: Protect with bituminous/asphaltic coating.
- B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M requirements.
- C. Aluminum: Mechanical finish; medium satin directionally textured (AA-M32).
- D. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

- A. Install flagpole and fittings in accordance with manufacturer's instructions.
- B. Electrically ground flagpole installation with ground spike and plate.
- C. Fill base around foundation tube sleeve with concrete specified in Section 033000.
- D. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.
- E. Fill foundation tube sleeve with sand and compact.

F. Seal around top of foundation tube sleeve with two inches of elastomeric sealant.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard functions smoothly.

END OF SECTION 107500

**SECTION 112300
COMMERCIAL LAUNDRY EQUIPMENT**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NAECA - National Appliance Energy Conservation Act.
- B. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of equipment specified.
 - 1. Include product data on anchors to be used, including structural pull-out and shear capacity, with data indicating compliance with manufacturer's requirements.
- B. Installer Qualifications.
- C. Operation and Maintenance Data.
- D. Warranties: Provide warranty information as specified.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer, certified in writing by the manufacturer to be qualified for installation of specified products.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).
 - 1. Provide laundry equipment and components that are listed and labeled per NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction.
- C. Energy Standards: Commercial laundry equipment shall meet NAECA standards.
 - 1. Laundry equipment shall include labels indicating energy-cost analysis and efficiency information as required by the FTC Appliance Labeling Rule.

1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Washer/Extractor: Provide three (3) year manufacturer warranty for replacement of any faulty part of washer unit, and a five (5) year warranty specifically for replacement of bearings, bearing seal assembly, frame, cylinder, and shaft assembly.
- C. Drying Tumbler: Provide three (3) year manufacturer warranty for replacement of any part of the drying tumbler assembly.

PART 2 PRODUCTS

2.01 LAUNDRY APPLIANCES

- A. Commercial Washer/Extractor: Front-loading, automatic, washer-extractor type; operable at water pressures from 15 to 120 psi.
 - 1. Capacity: 40 lbs, minimum.
 - 2. Cylinder: Perforated stainless steel drum; volume 6.3 cu. ft., minimum.
 - 3. Controls: Solid state electronic, touch pad controls for water fill level, water temperatures, and speed and fabric cycle selectors.

4. Motors: Permanently lubricated, manufacturer's standard HP for washer/extractor capacity indicated.
 5. Finish: Painted steel; manufacturer's standard color.
 6. Electrical Requirements: 208/240 V; 3 Phase; 15 A breaker.
 7. Manufacturers:
 - a. Belco Athletic Laundry Equipment.
 - b. Miele, USA.
 - c. Milnor (Pellerin-Milnor Corporation).
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Commercial Clothes Dryer: Electric, front-loading, automatic, tumble-action type.
1. Capacity: 50 lbs, minimum.
 2. Cylinder: Perforated stainless steel drum; volume 18.3 cu. ft., minimum.
 3. Controls: Solid state electronic, touch pad controls for temperature and fabric cycles.
 4. Motor: Permanently lubricated, manufacturer's standard HP for dryer capacity indicated.
 5. Finish: Painted steel; manufacturer's standard color.
 6. Electrical Requirements: 440/480 V; 3 Phase; 40 A breaker.
 7. Manufacturers:
 - a. Belco Athletic Laundry Equipment.
 - b. Miele USA.
 - c. Milnor (Pellerin-Milnor Corporation).
 - d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in commercial laundry equipment to floor slab with approved anchorage devices.
- C. Verify that final installation clearances are adequate to properly and safely operate and maintain equipment.
- D. Utility Connections: Refer to Division 22, 23, and 26 for plumbing, ventilation, and electrical requirements, and provide final connections to utilities.

3.03 STARTUP, DEMONSTRATION, AND TRAINING

- A. See Section 017900 - Demonstration and Training for additional requirements.
- B. Manufacturer Services: Provide services of manufacturer's field representative to ensure proper operation of commercial equipment and to provide demonstration and training.
- C. Demonstrate proper operation of equipment to Owner's designated personnel.
- D. Training: Train Owner's personnel on operation and maintenance of system.

3.04 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.05 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 112300

**SECTION 113013
RESIDENTIAL APPLIANCES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- C. UL (DIR) - Online Certifications Directory.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with a service center within 50 miles of Project site capable of maintenance and emergency repairs.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).
- C. Accessibility: Where ADA-compliant appliances are indicated, provide appliances that comply with reach ranges and operable parts requirements in compliance with ICC A117.1 and ADA Standards.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. BOSCH Home Appliances.
 - 2. Fisher and Paykel.
 - 3. Frigidaire Home Products.
 - 4. GE Appliances.
 - 5. Jenn-Air.
 - 6. Maytag.
 - 7. Whirlpool Corp.

2.02 KITCHEN APPLIANCES

- A. Refrigerator: Free-standing, top-mounted freezer, and frost-free.
 - 1. Basis-of-Design Product: GE Appliances; Model GTE22JTNRSS.
 - 2. Capacity: Total minimum storage of 21 cubic ft; minimum 25 percent freezer capacity.
 - a. Provide ADA-compliant model; at least 50 percent of freezer shall be located within 54 inches of floor.
 - 3. Energy Usage: Provide ENERGY STAR qualified product.
 - 4. Features: Include glass shelves, automatic icemaker, and light in freezer compartment. Do not provide water dispenser.
 - 5. Electrical Requirements: 120V; 60 Hz; 15 Amp.
 - 6. Exterior Finish: Stainless steel.

- B. Microwave: Countertop.
 - 1. Capacity: 0.7 cubic ft.
 - 2. Power: 700 watts.
 - 3. Features: Include turntable, cooktop light, night light, 2-speed exhaust fan, and built-in trim kit.
 - 4. Exterior Finish: Black.
- C. Waste Disposer: Standard type, overload protection, direct wired, dishwasher connection, drain elbow, drain connector, and sound reduction features.
 - 1. Power: 1/3 HP.
 - 2. Capacity: Large.
 - 3. Height: 14-1/2 inch.
 - 4. Depth: 8-1/2 inch.
 - 5. Controls: Wall switch.
 - 6. Voltage: 115 volts, 60 Hz, 4 amps.
- D. Dishwasher: Undercounter. Provide ADA compliant product, no more than 32-1/4 inch high, to fit under 34 inch counter.
 - 1. Basis-of-Design Product: GE Appliances; Model GDT226SSLSS.
 - 2. Width: 24 inches.
 - 3. Controls: Solid state electronic, top mounted in door.
 - 4. Energy Usage: Provide ENERGY STAR qualified product.
 - 5. Wash Levels: Three (3); auto, heavy, and light.
 - 6. Features: Include rinse aid dispenser, temporary temperature boost option, child lock, delay start, and sanitize option.
 - 7. Electrical Requirements: 120V; 60 Hz; 8.9 Amp.
 - 8. Finish: Stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 113013

SECTION 114000 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract including general and supplementary conditions and general requirements apply to the work specified in this section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Plumbing: Refer to Division 22, including:
 - 1. Rough-in piping for gas and water supply and waste lines.
 - 2. Piping for supply and waste lines.
 - 3. Traps, grease traps, line strainers, tail pieces, valves, stops, shut offs and miscellaneous fittings required for complete installation.
 - 4. Final connections.
 - 5. Indirect drains for sink compartments.
- B. Mechanical: Refer to Division 23, including:
 - 1. Roof mounted fans and connecting ductwork not shown as part of the kitchen equipment.
 - 2. Final connections, including approved welded duct connections to hoods.
- C. Electrical: Refer to Division 26, including:
 - 1. Rough-in conduit, wiring, line and disconnect switches, safety cut-offs and fittings, control panels, fuses, boxes, and fittings required for complete installation.
 - 2. Final connections, including mounting and wiring of switches furnished as part of the food service equipment (unless otherwise indicated on the drawings).
- D. Mechanical Work:
 - 1. Provide exhaust hoods with connection collars ready for final connection by HVAC Section.
 - 2. Provide stainless steel exposed ducts to ceiling for dishmachine.

1.3 WORK INCLUDED THIS SECTION:

- A. Furnish and install all food service equipment as specified herein, including that which is reasonably inferred, with all related items necessary to complete work shown on contract drawings and/or required by these specifications.
- B. Electrical Work:

1. Interwiring of food service equipment between components within equipment, such as heating elements, switches, thermostats, motors, etc., complete with junction box as is applicable, ready for final connection.
2. Voltages shall be as indicated on contract drawings. Any differences in electrical characteristics at job site from those shown on contract documents must be submitted to Architect for consideration prior to ordering equipment.

C. Plumbing Work:

1. Furnish all equipment with faucets, sink waste assemblies, and trim as specified in this section.
2. Other than sink compartments, extend all indirect waste lines to nearest floor receptor. All such drain lines to be properly sized. Drain shall terminate with proper air gap above flood rim of floor receptor. Drain lines to be copper with silver paint unless specified otherwise. Drain lines in public areas to be chrome plated where exposed to public view.

D. Mechanical Work:

1. Provide exhaust hoods with connection collars ready for final connection by Division 23.

1.4 QUALITY ASSURANCE

- A. It is required that all custom fabricated equipment such as food serving units, tables, sinks, counter tops, etc., be manufactured by a food service equipment fabricator who has the plant, personnel and engineering equipment required. Such manufacturer shall be subject to approval of Architect. All work in the above category shall be manufactured by one manufacturer and shall be of uniform design and finish.
- B. Manufacturer of this equipment must be able to show that they are now and for the past five years have been engaged in manufacture or distribution of equipment, as required under this contract, as their principal product.
- C. Manufacturer of equipment herein specified shall be a recognized distributor for items of equipment specified herein which are of other manufacture than their own.
- D. Only manufacturers who can meet the foregoing qualifications will be acceptable.
- E. All work shall be done in an approved professional manner, to the complete satisfaction of the Owner.

1.5 SUBMITTALS

- A. Submit shop drawings as required by General Conditions. All shop drawings and rough-in drawings shall be CAD drafted and must be submitted in .DWF or .PDF electronic format. Multiple hard copies are not acceptable.
- B. Shop drawings and bound brochures covering manufactured or "buy-out" items covering all work and equipment included in this contract shall be submitted to Architect as soon as possible

after award of contract. After approval, Food Service Equipment Contractor shall furnish to Architect electronic files of shop drawings and brochures, corrected as required by virtue of review comments, for distribution to various interested trades on project. All costs of reproduction and submission shall be part of the contract.

Bound brochure and cut sheet submittals must be copied to Owner for review and comment.

- C. Provide fully dimensioned rough-in plans at 1/4" scale, consisting of a separate drawing for each discipline. Each drawing shall show equipment shaded down 50%. Rough-in set shall include all required mechanical, electrical, plumbing, services for equipment and dimensioned rough-in location for same. Rough-in locations shown shall make allowances for required traps, switches, etc., thereby not requiring interpretation or adjustment on the part of other Contractors. Food Service Equipment Contractor shall visit site to verify all rough-in and sleeve locations prior to installation of finished floors and shall cooperate with other Contractors involved in proper location of same. Food Service Equipment Contractor shall be responsible for any required relocations of rough-in due to errors or inaccuracies on those rough-in plans which they prepare.
- D. Rough-in plans shall include all required services which relate to equipment, but which may not directly connect thereto, such as convenience outlets at walls, hose stations, floor drains, etc.
- E. Rough-in plans shall also include all required outlet services for equipment which is designated on the drawing schedule, even though such equipment may not be included in this contract. Drawings shall indicate dimensions for floor depressions, wall openings, etc., for equipment.
- F. Fully dimensioned and detailed shop drawings of custom fabricated equipment items shall be submitted, drawn at 3/4" and 1 - 1/2" scale for plans, elevations, and sections respectively. Drawings shall show all details of construction, installation, and relation to adjoining and related work where cutting or close fitting is required. Drawings shall show all reinforcements, anchorage, and other work required for complete installation of all fixtures.
- G. Do not begin fabrication of custom manufactured equipment until approvals of shop drawings have been received and until field measurements have been taken by Food Service Equipment Contractor, where such measurements are necessary to assure proper conformance with intent of contract drawings and specifications.
- H. Make field measurements, giving due consideration to any architectural, mechanical, or structural discrepancies which may occur during construction of building. No extra compensation will be allowed for any difference between actual measurements secured at job site and dimensions indicated on contract drawings. Any differences which may be found at job site during field measurements shall be submitted to Architect for consideration before proceeding with fabrication of equipment.
- I. Submit illustrative brochures for manufactured or "buy-out" equipment items, complete with illustrations, specifications, line drawings, rough-in requirements, and list of accessories or other specified additional requirements. Brochures shall be bound and shall include data on all equipment which is to be provided, arranged in numerical sequence which conforms to item numbers of specifications. Omission of data does not reduce obligation to provide items as specified.
- J. Approval of shop schedules and brochures will be in general and shall be understood to mean that Architect has no objection to use of materials or processes shown. Approval does not relieve Food

Service Equipment Contractor from responsibility for errors, omissions, or deviations from their contract requirements.

1.6 SUBSTITUTIONS - STANDARDS

- A. Refer to Instructions to Bidders and Division 01 for requirements.
- B. All unspecified substitutions after bid must be submitted to Owner for written approval prior to acceptance.

1.7 DRAWINGS

- A. Drawings which constitute part of contract documents indicate general arrangement of piping and location of equipment. Should it be necessary to deviate from the arrangement indicated to meet structural conditions, make such deviations without expense to Owner.
- B. Specifications and drawings are reasonably exact, but their extreme accuracy is not guaranteed. Drawings and specifications are for assistance and guidance of Contractor, and exact locations, distances and levels shall be governed by the building.

1.8 MANUFACTURER'S DIRECTIONS

- A. Follow manufacturer's directions in all cases where manufacturers of articles used in this contract furnish directions or prints covering points not shown on drawings or specifications.

1.9 INDUSTRY STANDARDS

- A. Electric operated and/or heated equipment, fabricated or otherwise, shall conform to latest standards of National Electric Manufacturers Association and of Underwriters Laboratories, Inc., and shall bear the U.L. label.
- B. Cooking and hot food holding equipment shall meet minimum construction standards as noted by NSF #4.
- C. Refrigeration equipment shall meet minimum construction standards as noted by NSF #7.
- D. Items of food service equipment furnished shall bear the N.S.F. seal.
- E. Food service equipment shall be installed in accord with N.S.F. standards.
- F. Work and materials shall comply with requirements of applicable codes, ordinances, and regulations, including but not limited to those of Occupational Safety and Health Act (OSHA), National Fire Protection Association, State Fire Marshal, State Accident Commission, U.S. Public Health Service, State Board of Health, local health codes, etc.
- G. No extra charge will be paid for furnishing items required by regulations, even though such may not be shown on drawings or called for in these specifications.

- H. Rulings and interpretations of enforcing agencies shall be considered part of regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURED EQUIPMENT

- A. All like types of equipment such as all refrigerated and heated cabinets, all ovens, and all mixers shall be by the same manufacturer.
- B. Except as may be specified otherwise under individual item specifications in "Equipment Schedule", all items of standard manufactured equipment shall be complete in accord with manufacturer's standard specification for specific unit or model called for, including finishes, components, attachments, appurtenances, etc., except as follows:
 - 1. All items of standard equipment shall be that manufacturer's latest model at time of delivery.
 - 2. Substitutions for manufactured equipment specified will be accorded consideration under terms set forth in "Substitutions - Standards".

2.2 FABRICATED EQUIPMENT

- A. Stainless steel shall be U.S. standard gauges as called for, 18-8, Type 302, Type 304, No. 4 finish.
- B. Galvanized iron shall be Armco or equal. Framework of galvanized iron shall be welded construction, having welds smooth, and where galvanizing has been burned off, touched up with high grade aluminum bronze.
- C. Legs and crossrails shall be continuously welded, unless otherwise noted, and ground smooth.
- D. Bottom of legs at floor shall be fitted with sanitary stainless-steel bullet type foot, with not less than 2" adjustment.
- E. Legs shall be fastened to equipment as follows:
 - 1. To sinks by means of closed gussets. Gussets shall be stainless steel, reinforced with bushing, having set screws for securing legs.
 - 2. To tables and drainboards with closed gussets which shall be welded to stainless steel hat sections or channels, 14 gauge or heavier, exposed hat sections having closed ends. Bracing shall be welded to underside of tops.
- F. Closed gussets shall be a 3" minimum diameter at top, continuously welded to frame members or to sink bottom.
- G. Sinks, unless otherwise specified, shall be furnished with rotary type waste outlets, without connected overflows: Atlantic Brass Works Model 772-RB; Fisher Brass Foundry Model 250A; T&S; or approved equal. Where exposed, furnish wastes chromium plated.

- H. Rolls shall be 1 1/2" diameter, except as detailed contrary, with corners bullnosed, ground and polished.
- I. Seams and joints shall be shop welded. Welds to be ground smooth and polished to match original finish. Materials 18 gauge or heavier shall be welded.
- J. Metal tops shall be one-piece welded construction, unless specified otherwise, reinforced on underside with stainless steel hat sections or channels welded in place. Crossbracing to be not more than 30" on centers.
- K. Drawers to be 18-gauge stainless steel channel type housing and drawer cradle, both housing and cradle being reinforced and welded at corners, housing being secured to underside of table top, and both housing and cradle being sized for and fitted with 18-gauge 20" x 20" x 5" deep stainless-steel drawer insert having coved corners. Drawer insert shall be easily removable from cradle without tools or having to remove entire drawer. Drawers to have stainless steel fronts. Provide with recessed flush type stainless steel pulls.
- L. Support drawer on fabricated 14-gauge stainless steel interlocking channel solid delrin ball bearing wheels. Support slides shall be load rated at 200 lb. per pair. Slides to be Component Hardware S52 Series.
- M. Enclosed cabinet type bases shall be made of formed steel sheets reinforced with formed steel sections to create a rigid structure. Steel shall be 18-gauge or heavier. Base shall be welded construction throughout with front rails, mullions, etc., welded to appear as one-piece construction. All exposed sections of interior and exterior shall be stainless steel, and unexposed sections shall be galvanized steel, unless specified contrary.
- N. Hardware shall be solid materials and except where unexposed or specified contrary, of cast brass, chrome plated. Stampings are not acceptable. Identify all hardware with manufacturer's name and number so that broken or worn parts may be ordered and replaced.
- O. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.
- P. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.
- Q. Fabricate sink compartments with fully coved vertical and horizontal corners. Multiple compartment partition to be double thickness, continuously welded where sheets join at top. Front of multiple compartment sinks to be continuous on exterior. Bottoms shall be creased to drain.
- R. Ends of all fixtures, splashbacks, shelves, etc., shall be finished flush to walls or adjoining fixtures.
- S. Dishtables, draintables, splashbacks and turned-up edges shall have radius bends in all horizontal and vertical corners, coved at intersections.
- T. Rounded and coved corners or radius bends shall be 1/2" radius or longer.

- U. Shelves in fixtures with enclosed bases shall be turned up on back and sides and feathered slightly to ensure tight fit to enclosure panels. Bottom shelves shall be made for easy removal unless otherwise noted.
- V. Undersides of tops to be coated with heavy-bodied resinous material compounded for permanent, non-flaking adhesion to metal, 1/8" thick, applied after reinforcing members have been installed, drying without dirt-catching crevices.
- W. Metal components, unless specified or noted otherwise, to be the following gauges:

Counter and table tops	14 ga.	Stainless Steel
Wall shelves	16 ga.	Stainless Steel
Pipe leg undershelves	16 ga.	Stainless Steel
Drawer fronts	16 ga.	Stainless Steel
Enclosed cabinet bases	18 ga.	Stainless Steel
Sinks and drainboards	14 ga.	Stainless Steel
Exhaust hoods	18 ga.	Stainless Steel
Legs 1 - 5/8" diameter	16 ga.	Stainless Steel
Doors (outer pan)	18 ga.	Stainless Steel
Doors (inner pan)	20 ga.	Stainless Steel
- X. Products fabricated by Savannah Industrial Solutions, John Boos, Premier Stainless, Eagle Group, Advance Tabco, or approved equal, modified to comply with specifications, are acceptable.

2.3 HEATING EQUIPMENT

- A. Wherever electric heating equipment or thermostat control for such equipment is specified, it shall be complete, and of the materials, size and rating specified within equipment item or details. All such equipment shall be designed and installed to be easily cleaned or to be easily removed for cleaning.
- B. Electrical appliances or heating element circuits of 120 volts shall not exceed 1650 watts, unless specifically shown contrary.

2.4 SWITCHES AND CONTROLS

- A. Food Service Equipment Contractor shall supply on each motor driven appliance or electrical heating unit suitable control switch of proper type in accord with Underwriter's Code.
- B. All internal wiring for fabricated equipment items included, all electrical devices, wiring, controls, switches, etc., built into or forming an integral part of these items shall be furnished and installed by Food Service Equipment Contractor in their factory or building site with all items complete to junction box for final connection to building lines by Electrical Contractor.
- C. Provide standard 3-prong plugs to fit "U" slot grounding type receptacles, similar to No. 5262, for all equipment items powered by plugging into 110-120 volts, single phase AC. Also, provide suitable length 3-wire cord for equipment.

2.5 CONNECTION TERMINALS

- A. All equipment shall be complete with connection terminals as standardized by equipment manufacturers, except where specified otherwise.

2.6 LOCKS

- A. Fit all doors for reach-in refrigerated compartments with locking type latches. Provide master keys.

2.7 GAS EQUIPMENT

- A. Equipment to be suitable for use with gas available at site, and to be furnished by F.S.E.C. with pressure regulators designed to work with incoming pressure.

2.8 GAS QUICK DISCONNECTS

- A. Where specified, gas quick disconnects shall be furnished complete with gas valve, gas connector hose, quick disconnect fitting elbows, and restraining cable, all AGA approved. Gas hose shall be flexible, braided or corrugated stainless steel with smooth plastic exterior coating or sleeve of heat shrink tubing (provide on all caster mounted gas equipment).
- B. All mobile cooking equipment requiring surface protection by fire suppression nozzles shall be secured in place by stainless steel cradle type wheel stops as manufactured by the Eagle Group or Select Stainless products. Plastic wheel stops are not acceptable.

2.9 LAMINATED PLASTIC

- A. Wherever laminated plastic materials are specified, they shall be Formica, Wilson-Art, Micarta, or approved equal. Veneer all materials using urea base cement, waterproof and heatproof. Rubber base adhesives are not acceptable. Apply materials directly over close-grained plywood such as mahogany or birch. Standard fir plywood is not acceptable. Face exposed surfaces and edges with 1/16" material and corresponding back faces with 1/32" reject material. Place top sheet on and over finished edge.

PART 3 – EXECUTION

3.1 GENERAL

- A. Work under this contract and covered under this section of specifications includes but is not limited to:

1. Cutting of holes and/or ferrules on equipment for piping, drains, electrical outlets, conduits, etc. as required to coordinate installation of food service equipment with work of other Contractors on project.
2. Field checking of building and rough-in requirements, and submission of brochures and shop drawings, all as required hereinbefore under "Submittals".
3. Repair of all damage to premises as result of this installation, and removal of all debris left by those engaged in this installation.
4. Having all food service equipment fixtures completely cleaned and ready for operation when building is turned over to Owner.

3.2 INSTALLATION PROCEDURES

- A. Food Service Equipment Contractor shall make arrangements for receiving their custom fabricated and "buy out" equipment and shall make delivery into building as requisitioned by their installation superintendent. They shall not consign any of their equipment to the Owner or to any other Contractor unless they have written acceptance from them and have made satisfactory arrangements for the payment of all freight and handling charges.
- B. Food Service Equipment Contractor shall deliver all their custom fabricated and "buy out" equipment temporarily in its final location, permitting Trades to make necessary arrangements for connection of service lines; they shall then move equipment sufficiently to permit installation of service lines, after which they shall realign their equipment level and plumb, making final erection as shown on contract drawings.
- C. All portable or counter mounted equipment weighing more than 25 pounds shall be mounted on 4" stainless steel adjustable legs.
- D. This Contractor shall coordinate their work and cooperate with other trades working at site toward the orderly progress of the project.
- E. Architect or Owner's Agent shall always have access to plant or shop in which custom fabricated equipment is being manufactured, from time contract is let until equipment is shipped, in order that progress of work can be checked, as well as any technical problem which may arise in coordination of equipment with building. Any approval given at this point of manufacture shall be tentative, subject to final inspection and test after complete installation.
- F. Food Service Equipment Contractor shall assist Architect, Owner, and/or Owner's Agent in making any desired tests during or prior to final inspection of equipment; they shall remove immediately any work or equipment rejected by Architect, Owner, and/or Owner's Agent, replacing same with work conforming with contract requirements, and shall reimburse mechanical and/or other contractors involved for extra work made necessary by such replacement.
- G. This Contractor shall keep premises free from accumulation of their waste material and rubbish, and at completion of their work shall remove their rubbish and implements, leaving areas of their work broom clean.
- H. This Contractor shall provide and maintain coverings or other approved protection for finished surfaces and other parts of their equipment subject to damage during and after erection. After removal of protective coverings, all field joints shall be grounded, polished and entire work shall be thoroughly cleaned and polished.

3.3 TRIMMING AND SEALING EQUIPMENT

- A. Seal completely spaces between all units to walls, ceilings, floors, and adjoining (not portable) units with enclosed bodies against entrance of food particles or vermin by means of trim strips, welding, soldering, or commercial joint material best suited to nature of equipment and adjoining surface material.
- B. Close ends of all hollow sections.
- C. Equipment butting against walls, ceilings, floor surfaces and corners to fit tightly against same; backsplashes or risers which fit against wall to be neatly scribed and sealed to wall with Dow Corning # 732 RTV or General Electric clear silicone sealant, wiping excess sealant out of joint to fillet radius. Where required to prevent shifting of equipment and breaking wall seal, anchor item to floor or wall.
- D. Treat enclosed spaces (inaccessible after equipment installation) for vermin prevention in accord with industry practice.

3.4 TESTING AND DEMONSTRATION OF EQUIPMENT

- A. After completion of installation, all equipment using water, gas, and electricity shall be performance inspected and tested by factory certified service agent, including wet test of hood fire suppression systems, if so required. Food Service Equipment Contractor shall document that these inspections have been performed prior to scheduling demonstrations and Owner acceptance of equipment.
- B. Food Service Equipment Contractor shall arrange to have all manufactured, mechanically operated equipment furnished under this contract demonstrated by authorized representatives of equipment manufacturers, these representatives to instruct Owner's designated personnel in use, care and maintenance of all items of equipment after same are in working order. Demonstration and instruction shall be held on dates designated by Owner.
- C. Food Service Equipment Contractor shall provide a competent service representative to be present when installation is put into operation.

3.5 EQUIPMENT HANDLING AND STORAGE

- A. Deliver equipment to site, properly crated and protected, and store in safe place, protected from damage until time for installation.

3.6 GUARANTEE

- A. Special Project Warranty: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required, provided

manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. This warranty shall be in addition to, and not limitation of, the rights the Owner may have against the Contractor under the Contract Documents.

B. Warranty Period:

1 year minimum from date of Substantial Completion, all new equipment furnished.
5-year warranty period on refrigeration compressors.
10-year warranty period on walk-in panels.

3.7 OPERATING AND MAINTENANCE MANUALS

- A. After completion of installation, Food Service Equipment Contractor shall present to Owner three sets of all operating and maintenance manuals, covering all mechanically operated equipment furnished under this contract, each set being neatly bound in loose-leaf binder having durable cover.
- B. Include in each binder a list of names, addresses and telephone numbers of local servicing agencies authorized to make necessary repairs and/or adjustments of equipment furnished under this contract.

4.0 EQUIPMENT SCHEDULE

ITEM 01 COLD STORAGE ASSEMBLY QUANTITY AS SCHEDULED

Provide prefabricated cold storage room assembly of size and shape shown on plan and detail drawings. Exact overall size to be field verified prior to fabrication.

- A. Insulation:
Panels shall be insulated with 4" urethane, foamed or poured in place using HCPC (no CFC) blowing agent. Foam shall be 2.25 lb. density, 95% closed cell. Panels shall meet STME-84 (UL-723) and be listed by Underwriters laboratories. Panels shall have a maximum flame spread of 25, maximum smoke developed of 450 minimum. Flash ignition of 600 degrees and minimum self-ignition of 800 degrees F.
- B. Coved corners:
Assembly shall be constructed so that all interior wall, floor, and ceiling intersections shall comply with N.S.F. requirements.
- C. Cam lock fasteners:
All panel intersections and wall, floor and ceiling intersections shall be secured by cam-lock fasteners connected with 2" wide metal straps set in and surrounded by insulation.
- D. Finishes:
Exterior and interior finishes shall be as shown on drawings.
- E. Doors:
Door size and finish shall be as shown on drawings, and shall be furnished complete with sill wiper gasket, and a minimum of 3 spring loaded lift type hinges. Doors to be Super doors with a reinforced 14 ga. U-Channel steel frame, backed with additional 1/8" steel plate drilled and tapped where all hardware is mounted. 3/16" backing on all doors larger than 42" wide. Exterior door to be equipped with automatic door closer. Cooler and Freezer doors to be equipped with perimeter heat. All doors to be equipped with heavy duty padlocking pull-handle lever, with inside safety release.

- F. Thermometers:
Each compartment to be provided with exterior flush mounted thermometer mounted at eye level to each door. Provide remote read-out for freezer compartment at exterior cooler door.
- G. Lights:
Each compartment to be furnished complete with manufacturer's standard light fixtures, having protective cover, mounted and pre-wired to switch with pilot light in door section. Extra light fixtures as needed to provide 30-foot candles 30" above floor. Lights to be furnished and installed by this section.
- H. Ceiling panels to be one piece, self-supporting and span full width of assembly when available.
- I. Floor:
Recessed insulated floor by Food Service Equipment Contractor with .100 diamond tread aluminum
Reinforced floor panels to support minimum 1200 pounds per square foot.
The floor and ceiling shall have maximum length panels to span full length of box, if possible, otherwise stagger joints so there are no common "four corner" intersections and no joints occurring in doorways.
- J. Refrigeration System:
Shall be furnished by manufacturer as part of cold storage room assembly, provide each compartment with complete refrigeration system sized to maintain appropriate temperature. Provide temperature alarm system with remote read-out and recording capability.
Provide two (2) complete and redundant refrigeration systems for each walk-in cooler and freezer compartments. The second refrigeration system shall be designed to alternate running cycles during normal operation and to allow one refrigeration set to continue to run should the other system have a required service.
Condensing units to be air-cooled, remote. Units to have performance and wiring characteristics as scheduled on drawings. Refrigeration systems to be designed for use with R448 refrigerant. Condensing units to be provided with painted galvanized steel all-weather housing, controls, and crankcase heaters, all suitable for outdoor conditions, and located as shown on drawings. Evaporators to be low-silhouette type with adaptive defrost control equal to a Bally SmartVap+controller. Evaporators to be equipped with 2speed EC motors, running full speed while refrigeration is engaged, and running at 1/3 speed while system is pumped down; mounted at locations shown on drawings. Performance and wiring characteristics to be as scheduled on drawings. Condensing units shall be provided with 2 speed EC fan motors, running full speed while refrigeration is engaged and 1/2" speed while ambient temp is below 60 degrees Fahrenheit. Also, the crank case heater will be turned off at an ambient above 60 degrees Fahrenheit.
The evaporator drain lines are to be provided by this section and extended to floor receptors outside assembly.
Freezer drain lines to be wrapped with heater cable and insulated with pre-molded foamed plastic insulation suitable for the application. Thickness as recommended by manufacturer.
Refrigerant lines over 75 feet must be field verified.
Refrigerant piping to be ACR copper tubing, hard temper, with wrought fittings and silver solder joints. Insulate suction lines with pre-molded foamed plastic insulation, thickness as recommended by manufacturer for temperature and application.
Refrigeration systems to be provided with all required refrigerant piping, insulation, sight glass vibration eliminator, solenoid(s), dryer, suction line filter, expansion valve(s), thermostat(s), heat exchangers, and defrost timers, etc. as necessary for complete installation. Provide pump control circuit consisting of thermostat and solenoid valve. All components including piping and insulation to be installed using accepted industry standards, manufacturer's instructions, and first-class workmanship.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

- C. With separate polymer tie for joining racks
 - D. Corrosion proof polymer construction with antimicrobial protection
- Dunnage rack to be as manufactured by Metro, Model No. HP2260PDMB, Cambro, or Eagle Group.

ITEM 04 AIR CURTAIN QUANTITY AS SCHEDULED

Provide air curtain with the following features:

- A. For 42" wide door
- B. Unheated
- C. Galvanized steel cabinet
- D. Obsidian black powder coat finish
- E. Microswitch at door
- F. Voltage as scheduled, direct connection

Air curtain to be as manufactured by Mars Air Systems, Model No. LPN242-1UA-OB, Curtron, or Berner.

ITEM 05A SHELVING UNIT QUANTITY AS SCHEDULED

Provide wire shelving unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings.
- B. 600 lb. capacity per shelf
- C. 2000 lb. capacity per unit
- D. (5) Quick-adjust shelves with removable polymer open-grid shelf mats and epoxy coated one-piece steel frames
- E. (4) Polymer posts
- F. Antimicrobial product protection

Shelving unit to be as manufactured by Metro, Model No.5Q567G3, or Cambro.

ITEM 05B SHELVING UNIT QUANTITY AS SCHEDULED

Provide wire shelving unit with the following features:

- A. Arrange using quantities and sizes as shown on plan drawings.
- B. 600 lb. capacity per shelf
- C. 2000 lb. capacity per unit
- D. (5) Quick-adjust shelves with removable polymer open-grid shelf mats and epoxy coated one-piece steel frames
- E. (4) Polymer posts
- F. Antimicrobial product protection

Shelving unit to be as manufactured by Metro, Model No.5Q557G3, or Cambro.

ITEM 06 NOT USED

ITEM 07 WORK TABLE, S/S TOP QUANTITY AS SCHEDULED

Provide work table with the following features:

- A. 96"W x 30"D
- B. 14 Gauge 304 SS top with countertop non drip edge
- C. 10" H Backsplash
- D. Galvanized legs with side & rear cross rails
- E. Flanged feet
- F. Drawer pan insert, 20"W x 20"D x 5"

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

Work table to be as manufactured by Advance Tabco, Model No. TVKG-308, Premier Stainless, or John Boos.

ITEM 07A WELD-IN SINK, SINGLE BOWL QUANTITY AS SCHEDULED

Provide weld-in sink for Item 09 with the following features:

- A. 20"W x 20"D x 12" deep bowl
- B. Includes faucet
- C. Disposer provision

Weld-in sink to be as manufactured by Advance Tabco, Model No. TA-11D, Premier Stainless, or John Boos.

ITEM 08 FOOD PROCESSOR, BENCHTOP QUANTITY AS SCHEDULED

Provide food processor with the following features:

- A. Includes: vegetable prep attachment with kidney shaped & cylindrical hopper (no bowl)
- B. (1) 3MM grating disc
- C. (1) 3MM slicing disc
- D. Stainless steel base
- E. Single speed 425 RPM
- F. Voltage as scheduled, cord and plug

Food processor to be as manufactured by Robot Coupe, Model No. CL50EULTRA, or approved equal.

ITEM 09 WORK TABLE, S/S TOP QUANTITY AS SCHEDULED

Provide work table with the following features:

- A. 96"W x 30"D
- B. 14 Gauge 304 SS top with countertop non drip edge
- C. 10" H Backsplash
- D. Galvanized legs with side & rear cross rails
- E. Flanged feet
- F. Drawer pan insert, 20"W x 20"D x 5"

Work table to be as manufactured by Advance Tabco, Model No. TVKG-308, Premier Stainless, or John Boos.

ITEM 09A WELD-IN SINK, DOUBLE BOWL QUANTITY AS SCHEDULED

Provide weld-in sink for Item 09 with the following features:

- A. Double sinks
- B. 20"W x 20"D x 12" deep bowls
- C. Includes faucet
- D. (1) Lever drain
- E. Disposer provision

Weld-in sink to be as manufactured by Advance Tabco, Model No. TA-11D-2, Premier Stainless, or John Boos.

ITEM 10 WORK TABLE, S/S TOP QUANTITY AS SCHEDULED

Provide work table with the following features:

- A. 48"W x 30"D

Provide single bank wall mount exhaust hood of size, shape and content as shown on detail drawings, having the following features:

- A. All exposed surfaces of 18-gauge 430 Series, 18-8 stainless steel construction
- B. N.F.P.A. 96 construction, including all joints and seams welded externally, continuous, and liquid tight
- C. 5/8" diameter hanger rods to structural ceiling, approximately 96" on center
- D. Stainless steel high-efficiency baffle type U.L. classified grease extracting filters, with handles
- E. Integral grease gutter sloped to drain to grease receptacle
- F. Vapor-proof U.L. listed recessed LED light fixtures
- G. Coordinated installation of fire suppression system as specified for Item 21
- H. Integral make-up air plenum along front as shown
- I. Provide spacer frame to allow passage of utility chase between hood sections and stainless-steel trim on bottom and ends
- J. Removable stainless steel perimeter trim and/or closure panels from top of hood to ceiling
- K. Food Service Equipment Contractor shall provide and install any secondary supporting members required to suspend exhaust hoods. Hood supports shall include seismic bracing, if required, installed in accord with SMACNA guidelines
- L. Fire suppression cabinet with pre-wire control package and switches with variable speed control fan.

Exhaust hood to be as manufactured by Captive-Aire, Model ND2-PSP, Gaylord, or Avtec.

ITEM 21 FIRE SUPPRESSION SYSTEM QUANTITY AS SCHEDULED

Provide automatic wet chemical fire suppression system as required to protect exhaust hood, Item 20, and the cooking equipment located under this hood, and having the following features:

- A. All tanks, control heads, piping, relays, cable, fusible links, nozzles, elbows, etc., as required for complete system
- B. Brass nozzles and chrome plated or sleeved exposed piping
- C. Manual strike mechanism in accessible location
- D. Installation in accord with N.F.P.A. 17A code requirements and coordinate with exhaust hood construction and installation
- E. Four contacts for use by E.C., one contact for alarm, one for supply fan shut-off, one for shunt trip actuation, and one spare
- F. Provide mechanical gas solenoid valve loose for installation by plumber

Fire suppression system to be as manufactured by Ansul, Model R-102, Pyro-chem, or Range Guard.

ITEM 22 PROOFER CABINET, MOBILE QUANTITY AS SCHEDULED

Provide proofer cabinet with the following features:

- A. Mobile
- B. Full-size, insulated
- C. Convection holding
- D. Accommodates (14) 18" x 26" sheet pans or (28) 13" x 18" sheet pans or (28) 12" x 20" hotel pans
- E. Load limit 65 lbs. (29.25 kg) per rack
- F. (2) Field reversible hinged solid dutch doors
- G. Magnetic door handle
- H. Touch control with processor
- I. HACCP temperature downloads
- J. Caster mounted
- K. USB audio & audio port

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No: 631310

- L. Manual water fill
 - M. Stainless steel interior & exterior
 - N. Voltage as scheduled, cord and plug
- Proofer cabinet to be as manufactured by Winston Foodservice, Model No. HOV5-14UV, Alto-Shaam, or Piper.

ITEM 23 COMBI-OVEN, ELECTRIC QUANTITY AS SCHEDULED

Provide combi-oven with the following features:

- A. Electric, ventless
 - B. With steam generator
 - C. (6) 18" x 26" Full size sheet pan or (12) 12" x 20" x 1" hotel pan capacity ovens
 - D. (6) Full size wire shelves, (6) half size fry baskets
 - E. Wi-fi read easy touch panel control with 99 cooking recipes storage
 - F. (4) Cooking modes: hot air, steam, combi-steam & retherm
 - G. Five-speed auto reversing fan
 - H. (3) wire shelves
 - I. Pull-out spray hose
 - J. Disappearing door with anti-microbial hygienic door handle
 - K. LED lights
 - L. Hands-free cleaning system
 - M. Stainless steel construction
 - N. Water filter
 - O. Backflow preventer
 - P. Stacking kit on 12" legs
 - Q. Voltage as scheduled, direct connection
- Combi-oven to be as manufactured by Convotherm, Model No. C4 ED 6.20ES-N, Alto-Shaam, or Piper.

ITEM 24 CONVECTION OVEN, GAS QUANTITY AS SCHEDULED

Provide convection oven with the following features:

- A. Gas heated, natural
 - B. Double-deck, standard depth
 - C. Capacity (5) 18" x 26" pans per compartment
 - D. Solid state infinite controls with 60 min. manual timer
 - E. Two speed fan
 - F. Porcelainized baking compartment
 - G. Dependent glass doors
 - H. Interior light
 - I. Flue connector
 - J. Stainless steel front, sides & top
 - K. Low profile casters, with caster stabilizing device
 - L. 36" Flexible gas hose with quick disconnect & restraining device
 - M. Voltage as scheduled, (2) cord and plug
- Convection oven to be as manufactured by Blodgett, Model No. ZEPH-100-G-ES DBL, Southbend, or Vulcan.

ITEM 25 RANGE, 12" HD, GAS QUANTITY AS SCHEDULED

Provide heavy duty range add-on unit with the following features:

ITEM 31 ICE MAKER, CUBE STYLE QUANTITY AS SCHEDULED

Provide ice maker and bin having the following features:

- A. Air-cooled
- B. Self-contained condenser
- C. Dual exhaust top/side air discharge
- D. 30" W
- E. Approximately 465 lb production/24 hours at 70°/50° (270 lb at 90°/70°)
- F. Full-size cubes
- G. Built-in antimicrobial protection
- H. LED status display
- I. One touch sanitize/descaling controls
- J. Dishwasher safe food zone components
- K. Water filter
- L. Backflow preventer
- M. Voltage as scheduled, direct connection

Unit to be as manufactured by Ice-O-Matic, Model CIM0436FA, Scotsman, or Manitowoc.

ITEM 31.1 ICE BIN QUANTITY AS SCHEDULED

Provide ice bin for Item 31 with the following features:

- A. 510 Lb. storage capacity
- B. 30"W x 31"D x 50"H
- C. Top-hinged
- D. Slope front door
- E. For top-mounted ice maker
- F. Polyethylene interior, durable aluminum exterior
- G. 6" Legs

Ice bin to be as manufactured by Ice-O-Matic, Model B55PS, Scotsman, or Manitowoc.

ITEM 32 PASS-THRU REFRIGERATOR QUANTITY AS SCHEDULED

Provide pass-thru refrigerator with the following features:

- A. Pass-thru
- B. One-section
- C. Self-contained refrigeration
- D. Stainless steel exterior, aluminum interior
- E. Standard depth cabinet
- F. Half-height solid doors, hinged on right
- G. Cylinder locks
- H. Electronic control with digital display
- I. Hi-low alarm
- J. 5" Casters
- K. R290 Hydrocarbon Refrigerant
- L. Voltage as scheduled, cord and plug

Pass-thru refrigerator to be as manufactured by Continental Refrigerator, Model No. 1RNSAPTHD, Beverage Air, or Hoshizaki.

ITEM 33 PASS-THRU HEATED CABINET QUANTITY AS SCHEDULED

Provide pass-thru cabinet with the following features:

- A. Pass-thru
- B. One-section
- C. 21 Cu. ft. capacity
- D. (3) Shelves
- E. Stainless steel exterior, aluminum interior
- F. Standard depth cabinet
- G. Narrow half-height doors, hinged on right
- H. Electronic control with digital display
- I. 5" Casters
- J. Voltage as scheduled, cord and plug

Pass-thru heated cabinet to be as manufactured by Continental Refrigerator, Model No. DL1W-SA-PT-HD, Beverage Air, or Hoshizaki.

ITEM 34 MILK COOLER

QUANTITY AS SCHEDULED

Provide milk cooler with the following features:

- A. Forced air, single access
- B. 34"W, 33-5/8"D
- C. Voltage as scheduled, cord and plug
- D. 6" Heavy duty casters, (2) with brakes
- E. Exterior digital thermometer
- F. (8) 13" x 13" x 11" or (4) 19" x 13" x 11" Case capacity
- G. Self-latching doors/lids with safety bumpers
- H. Cylinder lock
- I. Wire floor racks, floor drain
- J. Electronic control
- K. White exterior, stainless steel interior
- L. R290 Hydrocarbon refrigerant

Milk cooler to be as manufactured by Beverage Air, Model SMF34HC-1-S, or Continental, or Hoshizaki.

ITEM 35 SERVING COUNTER, COLD FOOD

QUANTITY AS SCHEDULED

Provide serving counter with the following features:

- A. With top extension
- B. Drain with valve
- C. 18 Gauge stainless steel base
- D. 5" Casters
- E. Self-contained refrigeration
- F. R290 Hydrocarbon refrigerant
- G. 36" Standard height
- H. Voltage as scheduled, cord and plug
- I. Line-up lock
- J. Toe plates
- K. Tray slide
- L. Workshelf
- M. Sneeze guard with LED light

Serving counter to be as manufactured by Delfield, Model No. SCSC-50-BP, Duke, or Piper.

Provide three compartment sink with the following features:

- A. With left & right-hand drainboards
- B. 28" Front-to-back x 20"W sink compartments, 14" deep, with 11"H backsplash
- C. Stainless steel legs with adjustable left-to-right and front cross rail
- D. 24" Drainboards
- E. 1" Adjustable bullet feet
- F. 14 Gauge 304 stainless steel
- G. T & S Brass, Model B-0231 wall mount faucet
- H. (3) Lever drains
- I. Sorting shelf

Three compartment sink to be as manufactured by Advance Tabco, Model 94-83-60-24RL, Premier Stainless, or John Boos.

ITEM 41 SOILED DISHTABLE, "L" SHAPED QUANTITY AS SCHEDULED

Provide soiled dishtable with the following features:

- A. L-shaped, fabricate as detailed
- B. Attaches to left of dish machine operator
- C. 10-1/2" H Backsplash
- D. Pre-rinse sink, with disposer provision
- E. Stainless steel legs, with stainless steel crossrails
- F. 14/304 Stainless steel
- G. Pre-rinse basket with slide bar
- H. Scrap block
- I. Pre-rinse unit
- I. Pass window as detailed, to accommodate roll-down door

Soiled dishtable to be as manufactured by Advance Tabco, Model DTS-K30-120L, Premier Stainless, or John Boos.

ITEM 42 DISHWASHER, CONVEYOR TYPE QUANTITY AS SCHEDULED

Provide dishwasher with the following features:

- A. Single tank
- B. Insulated hinged doors
- C. .62 Gallon/rack(202), racks/hour
- D. Stainless steel enclosure panels
- E. Microprocessor controls with low temperature & dirty water indicators
- F. NSF Pot & Pan mode
- G. Programable de-lime notification
- H. Electric tank heat 15kW
- I. Built-in integral 30kW electric booster
- J. Drain water tempering kit
- K. Voltage as scheduled, (2) direct connection
- L. Left to right operation
- M. Drain water tempering kit
- N. Table limit switch

Dishwasher to be as manufactured by Hobart, Model CL44EN-BAS+BUILDUP, Champion, or CMA Dishmachines.

**SECTION 115100
LIBRARY FURNISHINGS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's catalog data and descriptive information for each specified product.
- B. Shop Drawings: Indicate layout plans with quantities, details, including attachment/mounting details, and interface with adjacent construction.
 - 1. Indicate electrical service connections and fittings where electrical outlets or coordination is required.
- C. Selection Samples: Manufacturer's color charts, for all finishes requiring Architect's selection.
- D. Verification Samples: Provide manufacturer's standard size samples, illustrating each color selected, for each product.

1.02 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver furnishings to project site with manufacturer's protective covering. Do not remove protective covering until furnishings have been moved into final installation locations.

1.04 FIELD CONDITIONS

- A. Ambient Conditions: Do not install library furnishings until all finishes are complete and HVAC system is fully operating at occupancy conditions.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide minimum 10-year manufacturer warranty, executed by Contractor, Manufacturer, and Installer, from date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Library Furnishings - steel:
 - 1. BCI Libraries.
 - 2. Paragon
 - 3. VS America
 - 4. Smith System
- B. Source Limitations: Provide each type of product, produced by single manufacturer and obtained from single supplier.

2.02 STEEL & LAMINATE SHELVING

- A. Basis of Design Paragon IC Shelving

- B. Steel Frame: Constructed steel frame of 18 Gauge steel frame with four triangular 14 Gauge CRS gussets, or compatibly sturdy
- C. Flat Steel Shelves: Constructed of 20 Gauge cold rolled steel with a welded 18 Gauge cold rolled stiffner
 - 1. Fabricate shelves from steel sheet of thickness required to withstand 150 lb load-carrying capacity without deflection
 - 2. Provide shelves ends notched to receive the steel supporting pins. Provide BHMA A156-9, Type B04013 pin supports and holes at 1-1/4" increments
 - 3. Provide powder coat finish in color selected by Architect from manufacturers full range.
 - 4. Provide solid back component for double-face shelving units.
- D. Provide shelving ranges composed of "starter" and "adder" units. Join additional shelving units with bolted connection at bases, intermediate uprights and at cornices of tall (84" height) units.
- E. All shelving will have a continuous top with high-pressure plastic laminate surface.
- F. Shelf arrangements per side shall be as follows:
 - 1. For 42" height shelves, provide 1 fixed and 2 adjustable shelves for a total of 3.
 - 2. For 72" height shelves, provide 1 fixed and 5 adjustable shelves for a total of 6
 - 3. For 84" height shelves, provide 1 fixed and 6 adjustable shelves for a total of 7

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's written instructions. Installation shall be by the manufacturer's authorized representative and shall conform to the manufacturer's standard procedure.
- B. Install level, plumb, and true; shim as required, using concealed shims.
- C. Installation shall include provision of connecting hardware, closure panels and trim required for complete and finished installation.
- D. Furniture shall be securely set in place with permanent attachment where required.
- E. Systems Integration: Coordinate with electrical for field installation of electrical components and for connections to building electrical supply.
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- G. Install accessories according to Shop Drawings and manufacturer's written instructions.
- H. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

3.02 ADJUSTING

- A. Adjust cabinets and hardware for smooth operation of doors and drawers.
- B. Adjust shelving to ensure rigid attachment to supports.

3.03 CLEANING

- A. Clean all exposed surfaces of installed products after completion of work in the space.

3.04 PROTECTION

- A. Protect installed surfaces from subsequent construction operations with plastic film or other covering.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- B. Touch up and repair surfaces that are damaged during construction to match original finish. If damage can not be repaired, replace product.

END OF SECTION 115100

**SECTION 115213
PROJECTION SCREENS**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Indicate project-specific dimensions, verified field measurements, mounting details, and interface with adjacent construction.
 - 1. Include wiring diagrams for motor operators and actuators, wiring connections, and controls and switches.
 - 2. Provide details, including viewing surface sizes, masking borders, trim accessories, screen seam locations, and extra drop length.
- C. Operation and Maintenance Data: Provide manufacturer's operation and maintenance instructions.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.
- B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.
- C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 FRONT PROJECTION SCREENS

- A. Manufacturers:
 - 1. Bretford
 - 2. Bloch Enterprises, Inc. (BEI)
 - 3. Da-Lite Screen Company
 - 4. Draper, Inc (Motorized).
 - 5. Stewart Filmscreen Corporation
 - 6. Substitutions: See Section 016000 - Product Requirements.
 - B. Front Projection Screens: Factory assembled unless otherwise indicated.
 - 1. Located in Auditorium: Motorized, matte light diffusing fabric screen, horizontally tensioned, ceiling recessed.
 - a. Screen Dimensions: Manufacturer's standard, approximately 120 inch high by 192 inch wide (226 inch diagonal, 16:10 aspect ratio), with 24 inches of extra black drop at top of screen.
 - C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant per NFPA 701 and mildew resistant per ASTM G 21.
-

1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
- D. Masking Borders: Black, on four sides.
- E. Concealed-in-Ceiling Screen Cases: Aluminum, with integral roller brackets.
 1. Door Slat: Self trim; self-closing and -opening.
 2. Case Finish: Baked enamel.
 3. Case Color: White.
 4. End Caps: Steel; finished to match case.
- F. Electrically-Operated Screens:
 1. Roller: Steel, 3 inch in diameter, with locking device.
 2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
 3. Horizontal Tensioning: Tab-guided cable system.
- G. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.02 ELECTRICAL COMPONENTS

- A. Electrical Components: NFPA 70 compliant, listed and classified by UL or other acceptable testing agency as suitable for the purpose specified and indicated.
- B. Motors: Direct drive, 110/120 V, 60 Hz.
 1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.
 - a. Electrical Characteristics: 2.4 amps; maximum.
 - b. Motor mounted on sound absorber.
- C. Controls: Three (3) position control switch with plate.
 1. Provide cover plates that match the finish of other electrical cover plates at each location. Coordinate with Division 26 electrical subcontractor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is finished and ready to accept screen installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that openings for recessed screens are correctly sized.
- D. Verify type and location of electrical connections.
- E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.02 PREPARATION

- A. Coordinate screen installation with installation of projection systems.
- B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, speakers, fire suppression, display units (marker/tackboards), registers and grilles, and other indicated wall/ceiling mounted construction.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install screens in mountings as specified and as indicated on drawings.
- D. Install plumb and level.
- E. Install electrically operated screens ready for connection to power and control systems by others.
- F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
- G. Test electrical screens for proper working condition. Adjust as needed.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 115213

**SECTION 116143
STAGE CURTAINS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A391/A391M - Standard Specification for Grade 80 Alloy Steel Chain.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. FM (AG) - FM Approval Guide.
- F. ITS (DIR) - Directory of Listed Products.
- G. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- H. UL (DIR) - Online Certifications Directory.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.03 SUBMITTALS

- A. Product Data: Provide for each type of product as follows:
 - 1. Stage Curtains: Provide information on type of curtain, weight, location for use on project, and type of flame retardancy.
 - 2. Tracks: Provide capacity of each curtain track to support curtain weight and control curtain operation.
 - B. Shop Drawings: Indicate installation information for components not dimensioned or detailed in product data.
 - 1. Submit floor plans, elevations, sections, attachment details of curtains and operating clearances.
 - 2. Submit documentation indicating load capacity of each batten, track, attachment, and rigging components.
 - 3. Submit attachment locations for each type of curtain, and corresponding loads imposed on structure.
 - C. Selection Samples: Submit color chart for each type of stage curtain indicated that includes full range of colors, textures, and patterns available, along with 12-inch square fabric sample, in any color, of each fabric type and seam.
 - D. Verification Samples: Submit fabric full width by at least 12-inch long section of each selected fabric, with specified treatments applied and showing repeat of patterns; mark top and face of fabric.
 - E. Certificate: Certify that products of this section meet or exceed specified requirements.
 - F. Delegated Design Data: Indicate stage curtain system structural attachments, including analysis data signed and sealed by qualified designer responsible for their preparation.
 - G. Designer's Qualification Statement.
-

- H. Installer's Qualification Statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design of track support system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of the type specified; certified installation representative of curtain fabricator/manufacturer.

1.05 FIELD CONDITIONS

- A. Ambient Conditions: Do not install stage curtains until spaces are fully enclosed and watertight, and the following:
 - 1. Wet work in adjacent areas is complete and surfaces are dry.
 - 2. Work at and above ceiling level has been completed.
 - 3. Ambient temperatures and humidity of adjacent areas are maintained at levels when occupied for intended use.
- B. Field Measurements: Confirm supporting structural element locations and adjacent construction for stage curtains and rigging, and complete field measurements prior to fabrication and include these dimensions on shop drawings.

1.06 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. Defective Work includes, but is not limited to, stage curtain support and rigging that is not operating properly.

PART 2 PRODUCTS

2.01 FABRICATORS

- A. Stage Curtain and Track/Rigging Assembly Fabricators:
 - 1. Beck Studios Inc.; Milford, OH; <https://www.beckstudios.net/>
 - 2. Georgia Stage; Duluth, GA; <https://www.gastage.com/>
 - 3. LuXout Stage Curtains; Richmond, VA; <https://www.luxout.com/>
 - 4. Janson Industries; Canton, OH; <http://www.jansonindustries.com/>
 - 5. J.R. Clancy, Inc; Syracuse, NY; <https://www.jrclancy.com/>
 - 6. Texas Scenic Company, Inc; San Antonio, TX; <https://www.texasscenic.com/>
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Stage Curtain Systems Design: Engage qualified designer to develop design of stage curtain system, including comprehensive project specific analysis of necessary structural system attachments in compliance with performance requirements.
 - B. Structural Performance: Ensure attachment of stage curtain system to structure withstands material weight and operational loads applicable for this project and in compliance with local building codes and authorities having jurisdiction.
-

1. Design Loads: Weight of stage curtains and track system.
- C. Fire-Test Characteristics: Stage curtain fabrics in compliance with NFPA 701 flame propagation fire test requirements conducted by authorized testing agency, listed by UL (DIR), ITS (DIR), or FM (AG) and acceptable to authorities having jurisdiction.
 1. Permanently attach label to fabric of each curtain assembly indicating fabric treatment as follows:
 - a. Inherently Flame Retardant (IFR), fibers/yarns that are non-combustible for life of fabric.

2.03 STAGE CURTAIN FABRICS

- A. Provide curtains of matching fabric and color from single dye lot, and when size and quantity of curtains exceeds maximum dye lot size, provide curtain or adjacent pair of curtains from only one dye lot, and arrange curtain dye lots to minimize exposure of any differences.
- B. Polyester Velour: Weighing at least 25 oz/linear yd, napped fabric of 100 percent polyester with minimum pile height of 75 mil, 0.075 inch and minimum width of 54 inches.
 1. Application: Main Traveler and Main Valance curtains.
 2. Color: To be selected by Architect from manufacturer's full range.
 3. Texture: To be selected by Architect from manufacturer's full range.
 4. Pattern: To be selected by Architect from manufacturer's full range.
 5. Products:
 - a. KM Fabrics, Inc; Prestige. Basis of Design
 - b. LuXout; Prologue 22 oz.
 - c. Rose Brand; Encore.
- C. Polyester Velour: Weighing at least 13 oz/linear yd, napped fabric of 100 percent polyester with minimum pile height of 75 mil, 0.075 inch and minimum width of 54 inches.
 1. Application: Legs, intermediate and rear valances, and backdrop/cyclorama curtains.
 2. Color: To be selected by Architect from manufacturer's full range.
 3. Texture: To be selected by Architect from manufacturer's full range.
 4. Pattern: To be selected by Architect from manufacturer's full range.
 5. Products:
 - a. KM Fabrics, Inc; IFR Plateau Velvet/Velour 13 oz.
 - b. LuXout; Epilogue 14 oz.
 - c. Rose Brand; Apollo.

2.04 CURTAIN TRACK

- A. Steel Track: Commercial quality, roll-formed, galvanized steel sheet, ASTM A653/A653M, with G60 coating designation; with continuous bottom slot and each half of track in single continuous piece; black paint finish; including support and operation accessories.
 1. Thickness: As recommended by manufacturer for curtain loads and operation.
 - a. Medium-Duty: 16-gauge, 0.0598-inch minimum thickness.
 2. Products:
 - a. Automatic Devices Company; Besteel 170 series.
 - b. H & H Specialties, Inc.; 200 series.
 - c. Substitutions: See Section 016000 - Product Requirements.
- B. Curved Track: Shop fabricate curved portions of curtain track.

1. Curved Track Cable Guides: Provide outside idlers, mule pulleys, spindles, and guides as required for curve configuration and track length.
- C. Curtain Rails: Provide single or double curtain capacity as indicated on drawings, and end stops.
- D. Curved-Suspended-Track Stiffener: Steel pipe, 1-1/2-inch nominal diameter, Grade A, Schedule 40 in accordance with ASTM A53/A53M; support both sections of curved suspended tracks, with curve to match track.
- E. Clamp and Bracket Hangers: Steel clamps and brackets of required strength to support loads for attaching track to overhead support.
- F. Track-Lap Clamp: Clamp that matches track channel finish as necessary for attaching two tracks at center overlap.
- G. Operation:
 1. Manual Cord Operation: Curtain track with cord, pulleys, and floor pulley; must manually open and close the curtain.
 - a. Operating Line: 3/8-inch diameter, stretch-resistant operating cord with braided synthetic-fiber cover over solid, synthetic-fiber, linear filaments.
 - b. End Pulleys: One single dead-end and one double live-end pulley, with sheaves having shielded ball bearings housed in plated-steel covers that match track finish, and provide with bracket for securing off-stage end of curtain.
 - c. Floor Pulleys: Sheave, adjustable type with 3-inch (76 mm) diameter wheels, and having shielded ball bearings housed in plated-steel covers, painted black.
- H. Track System: Provide medium-duty curtain track with components as recommended by manufacturer for loads and operation, including track end stops.
 1. Carriers: Standard plated-steel carriers with a pair of polyethylene wheels riveted parallel to body, and equip carriers with and plated-steel swivel eye for attaching curtain snap or S-hook, and required number of curtain carriers for track length and curtain fabrication.
 - a. Master Curtain Carriers: One plated-steel master carrier for each leading curtain edge, with two pairs of nylon wheels and with two line clamps per carrier.
 2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with guarded ball-bearing sheaves enclosed in steel housings; pulleys with steel housing finished to match track and with bracket for securing off-stage end of curtain.

2.05 FABRICATION - CURTAINS

- A. General: Provide vertical seams unless otherwise indicated, locate vertical seams so they do not fall on faces of pleats, and only use fabric that is cut greater than half the width of fabric.
 - B. Vertical and Top Hems: Machine sew hems as follows, unless otherwise indicated:
 1. Vertical Hems: Fabricate at least 2 inches wide, and at least 4 inches wide at borders, valances, teasers, and tormentors with at least 1-inch tuck and without visible selvedge material from front of curtain; sew open ends of hems closed.
 2. Turnbacks: Fabricate leading-edge and trailing-edge turnbacks for traveler curtains by folding back at least 12 inches of face fabric, with at least 1-inch tuck, and vertically secured by sewing.
 3. Top Hems: Fabricate by double-stitching 3-1/2-inch wide heavy jute or laminated synthetic webbing to top edge at back side of curtain, and with at least 2 inches of face fabric turned under.
 - C. Fullness:
-

1. 50 Percent Fullness: Provide this fullness, exclusive of turnbacks and hems, and spaced at 12 inches on center along top hem reinforcement as follows:
 - a. Sewing additional material into 3-inch double-stitched, flat, box pleats.
- D. Grommets:
 1. Black Colored Curtains: No. 3 brass or No. 4 brass grommets with black finish.
 2. Pleated Curtains: Provide grommets centered on each box pleat and placed 1 inch from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows, unless otherwise indicated:
 1. For Curtains With Fullness:
 - a. Curtains That Don't Hang to Floor: Hems at least 3 inches deep, with weight tape, 3/4 inch, and open ends of hems sewn closed.
 - b. Floor Length Curtains: Provide hems at least 6 inches deep, with individual weights in individual closed pockets sewn above finished bottom edge of curtain, and open ends of hems sewn closed.

2.06 ACCESSORIES

- A. S-Hooks: Manufacturer's standard heavy-duty plated wire hooks, at least 2 inches long.
- B. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, colored to best match curtain; at least 5/8 inch wide by 36 inches long and threaded through grommets.
- C. Support, Clamps, and Anchors: Galvanized after fabrication sheet steel, Class B in accordance with ASTM A153/A153M; manufacturer's standard thickness.
- D. Trim and Support Cable: 1/4-inch diameter, 7x19 galvanized steel cable with minimum breaking load (MBL) of 7,000 lb.
 1. Provide fittings in accordance with cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- E. Trim and Support Chain: Hardened alloy steel chain rated for overhead lifting, Grade 80 in accordance with ASTM A391/A391M.
- F. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard and corrosion-resistant.
- G. Individual Curtain Bottom Weights: Curtain manufacturer's standard segmented weights in compliance with requirements for curtain type and location.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with installer present, for compliance with requirements for supporting structural members, blocking, clearances, installation tolerances, and other conditions that may impact performance of stage curtain assembly.
- B. Examine placement and condition of inserts, clips, blocking, or other supports installed by others and for use in supporting track and battens of stage curtain assembly.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install stage curtain assembly in accordance with curtain and track manufacturers written instructions.

3.03 INSTALLATION - CURTAIN

- A. Track Hung: Secure curtains to track carriers with S-hooks.

3.04 INSTALLATION - TRACK

- A. Mounting of Track Assembly:
 - 1. Beam Mounted: Install track by suspending from beam clamps securely mounted to structural I-beam and within intervals indicated in manufacturer's written instructions for on center spacing.
- B. Track Support Spacing: Comply with manufacturer's recommendations for applied loads, and not to exceed the following dimensions between track supports:
 - 1. Medium-Duty Track: 4 feet, maximum.
- C. Install track for center-parting curtains with at least 24-inch overlap of track sections at center-line, and supported with track lap clamps.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, and maintenance of each component.
- B. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.

3.06 PROTECTION

- A. Protect installed stage curtain assembly from subsequent construction operations until Date of Substantial Completion.

END OF SECTION 116143

**SECTION 116613
BALLET BARRES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Product Data: For each type of ballet barre product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
- B. Shop Drawings: Show location and extent of fully assembled ballet barres. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, attachments to other Work, and relationship to adjoining work.
- C. Samples for Verification: Not required.

1.02 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of ballet barre equipment through one source from a single manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ballet barre products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Harlequin Corp.
 - 2. The Cartwheel Factory.
 - 3. Custom Barres.
 - 4. Gerstung USA.
 - 5. Gibson Athletic.
 - 6. MatsMatsMats.
 - 7. Substitutions: Refer to Section 016000 - Product Requirements.

2.02 MATERIALS, GENERAL

- A. Steel Brackets: Steel fabrication as follows:
 - 1. Fixed Wall Type: Bar bracket or extension stud welded to predrilled mounting plate.
 - 2. Adjustable Wall Type: Extension stud with wing nut, washer and nut to lock to slotted wall-mounted channel.
 - 3. Floor Mount Type:
- B. Wood Barres: Red oak or hard maple, nominal 1-5/8 to 1-3/4-inch diameter. Sanded, unfinished.
- C. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or non-corrodible units to match bracket; to suit barre and supporting construction.

2.03 WALL-MOUNTED BARRES

- A. General: Provide wall-mounted barres with accessories and anchorage devices.

- B. Fixed Ballet Barre: Wall mounted single barre.
 - 1. Fixed height (top of barre): 42 inches. Confirm with Owner.
- C. Support Brackets: Steel brackets at 64-inch maximum span. Provide maximum of three brackets per barre length.
- D. Wall Clearance: 7 inches from wall to inside.
- E. Metal Finish: Chrome-plated.
- F. Wood Finish: Sanded natural finish, with eased edges at ends. Do not apply stains or varnishes.

PART 3 EXECUTION

3.01 EXAMINATION OF STUD WALL SUBSTRATES

- A. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly, where required.
- B. Coordinate installation of wall-mounted ballet barres with wall-mounted mirrors specified in Section 088300 - Mirrors.
- C. Unless otherwise indicated, install ballet barres after other finishing operations, including painting, have been completed.
- D. Permanently Placed Ballet Barres: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings.
- E. Anchoring to In-Place Construction: Use anchors and fasteners necessary for securing ballet barres to structural support and for properly transferring load to in-place construction.

3.03 CLEANING AND PROTECTION

- A. After completing ballet barre installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure ballet barres are without damage or deterioration at time of Substantial Completion.
- C. Replace ballet barres and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 116613

**SECTION 116623
GYMNASIUM EQUIPMENT**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- E. NFPA 70 - National Electrical Code.
- F. NFPA 101 - Life Safety Code.
- G. {RSTEMP#1857}NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth{CH#123426}.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.
 - 1. Coordinate requirements for electrical raceways, junction boxes, wiring, disconnects, connections with the electrical contractor.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection and wiring locations.
 - 2. Fire rating certifications.
 - 3. Manufacturer's installation instructions.
- B. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.
- C. Samples: Submit samples of wall pad coverings and divider curtain fabric, in manufacturer's available range of colors.
- D. Operating and maintenance data for each operating equipment item.
- E. Warranty: Submit manufacturer warranties and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Do not deliver until installation space is enclosed and conditioned.
- C. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

- D. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Divider Curtains: Provide five year manufacturer warranty for divider curtains, from date of Substantial Completion. Warranty shall cover deterioration or damage to divider curtain materials and defective operation.
- C. Interior Basketball Backstops: Provide 5 year manufacturer warranty for interior basketball backstops, from date of Substantial Completion.
- D. Basketball Backboards (Glass): Provide lifetime manufacturer warranty.
- E. Basketball Backboards (Particleboard): Provide 10 year manufacturer warranty, from date of Substantial Completion.
- F. Manual Goal Height Adjuster: Provide lifetime manufacturer warranty.
- G. Basketball Goals: Provide 5 year manufacturer warranty, from date of Substantial Completion.
- H. Backboard Safety Pads: Provide 5 year manufacturer warranty, from date of Substantial Completion.
- I. Volleyball Standards and Hardware: Provide 5 year manufacturer warranty on standards and 3 year manufacturer warranty on other hardware, from date of Substantial Completion.
- J. Interior Scoreboards with Protective Cage: Provide 10 year manufacturer warranty, from date of Substantial Completion.
 - 1. Wireless Controls: Provide 2 year manufacturer warranty, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. See drawings for sizes and locations, unless noted otherwise.
- B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.
- C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
- D. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
- E. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.02 GYMNASIUM DIVIDER CURTAINS

- A. Gymnasium Divider Curtains:
 - 1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester complying with NFPA 101.
 - 2. Hems & Seams: Double-thickness/double-turned mesh/fabric material, welded.
 - 3. Upper Section: Not less than 7 oz/sq yd vinyl mesh fabric.
 - a. Color: White.
 - 4. Lower Section: Not less than 18 oz/sq yd solid vinyl coated polyester.
 - a. Color: To be selected by Architect from manufacturer's full range.
 - b. Height Above Floor: 8 feet.

5. Overall Curtain Height: Floor to ceiling; so that bottom of curtain is 2 inches above floor in fully extended position.
6. Provide all structural steel overhead framing members, anchorage, fasteners, and hardware, and other components as required by manufacturer for a complete assembly and for secure mounting to overhead structure.
7. Operation: Vertical lift roll-up, curtain coils on bottom rail.
8. Folding Control System: Electric hoist with 115 volt actuator, manufacturer's standard motor of horsepower required for curtain size indicated, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
9. Controls: Three-position wall switch; key operated. Provide two keys per switch.
 - a. Coordinate switchplate cover with Division 26 electrical cover plates to match other cover plates in the space.
10. Width: As indicated on drawings.
11. Manufacturers:
 - a. ADP Lemco, Inc.
 - b. Arizona Courtlines, Inc.
 - c. Draper, Inc.
 - d. IPI by Bison, Inc.
 - e. Performance Sports Systems; a Gared Holdings company.
 - f. Porter Athletic, Inc.
 - g. Progressive Sports Construction Group.
 - h. Substitutions: See Section 016000 - Product Requirements.

2.03 BASKETBALL

- A. Basketball System: Backstop assembly, backboard, and goal. Provide complete assembly by single manufacturer.
- B. Wall-Mounted Backstop Assemblies: Wall-mounted steel frame assembly capable of mounting both rectangular and fan-shaped backboards.
 1. Distance of Backboard From Wall: 6'-0" nominal to front of backboard; adjustable by +/- 6 inches.
 2. Framing: Side-folding retractable framing.
 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 - a. Height Control System: Manual winch.
 4. Framing Color: Manufacturer's standard.
 5. Manufacturers:
 - a. Draper, Inc; Stationary Wall Mounted (SWD).
 - b. Porter Athletic; Model 90312000 - Stationary Backstop.
 - c. Progressive Sports Construction Group; Model 1350.
 - d. Performance Sports Systems; Model 2350.
- C. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
 1. Framing: Center mast, 6-5/8 inch diameter structural steel tube; with sway bracing to each side; forward folding framing, with front bracing.
 - a. Fittings: Attached to 6-5/8 inch diameter center mast by heavy 1/4 inch thick precision saddle die-cut formed steel fittings, secured in place by 5/8 inch diameter U-bolt hardware. Strap type half clamps are not acceptable.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

- b. Provide all structural steel overhead framing members, anchorage, fasteners, and hardware, and other components as required by manufacturer for a complete assembly and for secure mounting to overhead structure.
 2. Folding Control System: Electric hoist that folds backstop with 120 V, 3/4 HP motor, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
 - a. Safety Catch: Provide safety device consisting of nylon belt in an aluminum housing that limits free fall to no more than 3 inches in the event of mechanical failure of backstop components. Safety device shall be tested to catch a 1750 lb free falling load, with tensile strength of 6000 lbs.
 - 1) Strap Retractor: Provide accessory retractor device to hold safety cables/straps away from the field of play when backstop is in the lowered position.
 3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
 - a. Height Control System: Manual winch.
 4. Framing Color: Manufacturer's standard.
 5. Manufacturers (Forward-Fold; Front-Braced):
 - a. Draper, Inc; Model TF-20.
 - b. Porter Athletic; Model 90949.
 - c. Progressive Sports Construction Group; Model 849-FFFB.
 - d. Performance Sports Systems; Model 3107.
 - e. Substitutions: See Section 016000 - Product Requirements.
 - D. Backboards: Tempered glass, rectangular shaped; 72 inch wide by 42 inch high.
 1. Frame: Brushed aluminum edge, steel mounting.
 2. Main Court - Tempered Safety Glass: 1/2 inch thick; meeting the impact requirements of 16 CFR 1201 Category II or ANSI Z97.1 Class A.
 3. Auxiliary Court - Hardwood/Particleboard: Not less than 1-1/2 inch thick
 4. Markings: Painted.
 5. Provide safety padding for bottom edge, corners, and lower portion of left and right edges of backboard.
 6. Provide mounting kit.
 7. Color: Manufacturer's standard.
 8. Manufacturers: Provide product matching basis-of-design by same manufacturer supplying backstop(s).
 - a. Basis-of-Design is Porter Athletic 208 Center Strut Backboard Package.
 - E. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
 1. Net Attachment Device: Tube-tie.
 2. Breakaway mechanism, adjustable (180 lb or 230 lb). Rebound characteristics shall be identical to those of a fixed goal per NCAA regulation.
 3. Finish: Powder coat orange.
 4. Manufacturers: Provide product matching basis-of-design by same manufacturer supplying backstop(s).
 - a. Basis-of-Design is Porter Athletic 236154 Powr-Flex Competition Goal.
 - F. Electrical Controls and Accessories:
 1. Equipment Mounting Board: Provide plywood mounting board with clear coat finish for each electric motor/operator. Size as required for equipment size.
 2. Controls: Key-operated wall switch. Provide two keys per switch.
-

- a. Unless otherwise indicated, group controls for all folding backstops in a single location.
- b. Coordinate switchplate covers with Division 26 electrical cover plates to match other cover plates in the space.

2.04 FLOOR-MOUNTED EQUIPMENT

- A. Volleyball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
 1. Posts: 3 inch minimum O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
 2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
 - a. Top Hem Reinforcing: 2000 pound minimum break strength galvanized aircraft cable in nylon coating.
 - b. Bottom Hem Reinforcing: 1/4 inch diameter braided nylon rope with spring loaded, pressure type rope tensioner.
 - c. Size: Regulation size.
 3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.
 4. Provide net antenna and boundary markers.
 5. Protective Pads: Polyethylene foam covered with polyester reinforced vinyl fabric.
 6. Manufacturers:
 - a. Draper, Inc; Power Volleyball System (PVS).
 - b. Porter Athletic; Powr Line Competition Package.
 - c. Schelde Sports; A3 Plus Volleyball System.
 - d. Senoh; Indoor Volleyball System (with D1300 aluminum posts).
- B. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor to hold poles for nets and goals; installed flush with finish floor surface.
 1. Latch Cover: Chrome plated, round; tamper resistant lock with key.
 2. Sleeve: Steel.
 3. Depth of Sleeve: 10 inches from floor surface to bottom, including latch cover, unless otherwise indicated.

2.05 WALL PADDING

- A. Wall Padding: NFPA 286 compliant; fire-retardant foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
 1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
 2. Flammability: Entire assembly shall be tested to {RS#1857} and shall meet the following criteria:
 - a. During the 40 kW exposure, flames shall not spread to the ceiling.
 - b. During the 160 kW exposure:
 - 1) Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
 - 2) Flashover, as defined in NFPA 286, shall not occur.
 - c. The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.
 - d. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m².

3. Impact Resistance: Entire assembly shall be tested to and meet the impact resistance criteria of ASTM F 2440.
 4. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
 - a. Color: To be selected by Architect from manufacturer's full range.
 - b. Fabric Weight: 14 oz/sq yd, minimum.
 5. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
 6. Foam Thickness: Not less than 2 inches.
 7. Backing Board: Plywood.
 - a. Thickness: 7/16 inch, minimum.
 8. Mounting: Removable; Z-clips fixed to wall and to padding.
 9. Manufacturers:
 - a. Draper, Inc.
 - b. IPI by Bison, Inc.
 - c. Porter Athletic, Inc.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
1. Wall corners.
- C. Pad Cutout Accessories: Provide manufacturer's fire-retardant treated, molded rubber inserts as trim around field cutouts at outlets, switches, and other wall mounted elements. Secure molded inserts to back of wall pads.

2.06 SCOREBOARDS

- A. Main Gymnasium: Provide the following interior scoreboards and accessories for main court only. All displays shall be LED.
1. (2) Interior Scoreboards: Approximately 8'-0" wide by 6'-0" high by 6 inches deep, with "double-bonus" foul indicator and "time-outs left" accessory features, and with 13 inch high digits. Provide with customizable electronic team name message centers in lieu of "home" and "guest" captions. Scoreboard shall also provide scoring for volleyball. Provide 120 V (200W, 60 Hz, 1.7A) electrical configuration. Scoreboard color shall be selected by Architect from manufacturer's standard range.
 - a. Manufacturers:
 - 1) Daktronics; Model # BB-2103-13. (Basis-of-Design)
 - 2) Fair-Play; Model # BB-3660-4. (9'-0"W x 5'-6"H x 4"D)
 - 3) Nevco; Model # 2770. (8'-0"W x 6'-0"H x 8"D)
 2. (1) Controller: Manufacturer's standard multiple sport wireless controller with protective case. Provide 120 V (6W, 60 Hz) electrical configuration. Provide with minimum 25 foot power cord.
 - a. Manufacturers:
 - 1) Daktronics; All Sport 5000.
 - 2) Fair-Play; MP-80.
 - 3) Nevco; MPCW-7.
- B. Protective Enclosures: At each scoreboard, provide wire mesh screen fabricated of 14 gauge steel wire and supporting aluminum tube framing; complete assembly finished with flat black powder coat. Manufacturer shall size screen for total scoreboard size including stats displays as applicable.
-

1. Manufacturers:
 - a. Daktronics; Indoor Protective Screen.
 - b. Nevco; Protective Screen.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

- A. Install in accordance with Contract Documents and manufacturer's instructions.
- B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.
- C. Install equipment rigid, straight, plumb, and level.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering. Mount wall padding with bottom of pad assembly directly above top of resilient base product, not higher than 6 inches above finished floor level.
- F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 116623

**SECTION 116733
CLIMBING WALLS**

PART 1 GENERAL

1.01 ABBREVIATIONS AND ACRONYMS

- A. CWA: Climbing Wall Association.
- B. UIAA: International Climbing and Mountaineering Federation.

1.02 DEFINITIONS

- A. Artificial Climbing Wall: Sports equipment exclusively designed and originally built for climbing. Artificial climbing walls may be designed and used for lead climbing, top rope climbing, or bouldering/traversal.

1.03 REFERENCE STANDARDS

- A. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
- B. ASTM F2440 - Standard Specification for Indoor Wall/Feature Padding.
- C. {RSTEMP#undefined}

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct preinstallation meeting at the Project site no more than 7 days before starting the work. Review in-place structural construction, required temporary facilities that will be required and preparation work in the installation location.

1.05 SUBMITTALS

- A. Product Data: For each type of artificial climbing wall product and material, including primary wall materials, anchors, fasteners, and other hardware, and each type of required accessory.
- B. Shop Drawings (Traverse Wall): Provide plans, elevations, sections, and attachment details indicating installation locations, dimensions, and methods of assembly. Include quantity and general locations of modular holds.
- C. Delegated Design Documents: Drawings and calculations sealed by the qualified professional engineer responsible for their preparation.
- D. Designer's qualification statement.
- E. Installer's qualification statement.
- F. Operation and Maintenance Data: Provide operation and maintenance data for artificial climbing walls, components, and accessories.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect climbing wall products during transit, delivery, storage and handling to prevent damage, soiling, and deterioration.

1. Provide protective coverings on climbing wall finish and edges in accordance with manufacturer's recommendations.
- B. Store climbing wall products in an enclosed, conditioned space, in accordance with manufacturer's recommendations in area adjacent to climbing wall installation area.

1.08 FIELD CONDITIONS

- A. Ambient Conditions: Do not install climbing wall products until the installation space is fully enclosed and conditioned at occupancy conditions.
 1. Lighting: If required, provide additional artificial light sources for detailing work, in accordance with Division 1 Section "Temporary Facilities and Controls."
- B. Field Measurements: Provide field measurements of construction prior to fabrication and indicate on Shop Drawings. Verify that the climbing wall design fits to other construction.

1.09 WARRANTY

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for climbing wall and components. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Climbing Wall Manufacturers:
 1. Eldorado Climbing.
 2. EP Climbing (Entre-Prises).
 3. Everlast Climbing, a Playcore Company.
 4. Nicros.
 5. Rockwerx.
 6. Walltopia.
 7. Substitutions: See Section 016000 - Product Requirements.
- B. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.02 TRAVERSE WALL

- A. General: Provide traverse wall for installation in gymnasium or other active space without use of ropes, harnesses, or belay equipment; fabricated of modular panels with manufacturer's standard handhold assortment.
 1. Basis-of-Design Product: Everlast Climbing; Standard Climbing Wall.
 2. Panels: Traverse wall shall be fabricated of 4 foot wide by 8 foot high, 3/4-inch plywood panels with manufacturer's standard protective coating for a lightly textured surface.
 - a. Panel Finish Color: Match basis-of-design product indicated.
 3. Hand Holds: Each 4 x 8 panel shall have 20 handholds and 66 pre-installed T-Nuts to allow for field modification of hand hold locations. Manufacturer shall offer a minimum of 100 unduplicated hand hold shapes.
 4. Safety Line: Provide a visual safety feature marking approximate 3 feet above floor level.
 5. Safety Mats: Provide traverse wall with 3 inch thick fire-retardant safety mats that have been tested per NFPA 286, ASTM F1292, and ASTM F2440
 - a. Safety Mat Size: 4 foot wide by 6 foot high.

- b. Mat Locking System: Mats shall be permanently secured to traverse wall at bottom. Mats shall fold up and have nylon webbing loops to secure and lock the mats in place to handholds in the closed position.
 - c. Safety Mat Color: Selected by Architect from manufacturer's standard options.
6. Anchorage: Secure each 4 x 8 panel section to masonry wall with minimum six 1/2-inch sleeve anchors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas where artificial climbing walls are to be installed, with Installer present. Verify compliance with requirements for installation tolerances and
 - 1. Verify that the supporting structural substrate is complete and ready for installation of artificial climbing wall. Verify that attachment method is appropriate for substrate.
 - 2. Verify existing conditions meet manufacturer's installation requirements.
 - 3. Correct unsatisfactory conditions prior to proceeding with installation.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and the approved Shop Drawings.
- B. Support, anchor, and fasten components securely using anchors and fasteners as indicated or as required by manufacturer for application.
- C. Traverse Wall Installation: Mount bottom of each traverse wall panel above the top of wall base (approx 5- to 6- inches above floor level). Install each panel level and plumb.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer Services: Provide services of manufacturer's field representative to inspect installed artificial climbing wall. Verify that all holds are securely mounted and that belay devices operate properly, as applicable.
- B. Repair or replace defective work as directed by Architect upon inspection.

3.04 ADJUSTING AND CLEANING

- A. Adjust operable components as required for smooth and safe operation.
- B. Provide final cleaning of artificial climbing wall, components, and accessories, in accordance with manufacturer's maintenance instructions. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration and Training (Traverse Wall): Provide a minimum of two hours training by manufacturer's designated training personnel at the Project site.
 - 1. Instruct Owner's personnel in proper safety procedures and supervision of wall use, and in preventive maintenance and cleaning instructions.
 - 2. Instruct Owner's personnel in procedures for removal and reinstallation of traverse wall panels and for modification of hand hold locations.

END OF SECTION 116733

**SECTION 116843
EXTERIOR SCOREBOARDS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. ASTM C150/C150M - Standard Specification for Portland Cement.
- E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- G. NFPA 70 - National Electrical Code.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.
 - 1. Coordinate requirements for electrical raceways, junction boxes, wiring, disconnects, connections with the electrical contractor.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
 - 1. Electrical characteristics and connection and wiring locations.
 - 2. Manufacturer's installation instructions.
- B. Shop Drawings: Indicate locations, sizes and dimensions, face layouts, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section.
 - 1. Indicate utility requirements including electrical wiring diagrams.
- C. Design Data: Provide structural and physical characteristics and engineering calculations for support structure framing and foundations/footings; identify dimensional limitations; include load calculations at points of attachment to building structure.
- D. Samples: Provide color charts or chips indicating full range of manufacturer's available colors.
- E. Erection Drawings: Detailed dimensional requirements for proper location of support structure and scoreboards.
- F. Designer's Qualification Statement.
- G. Operating and maintenance data for each operating equipment item.
- 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. Warranty: Submit manufacturer warranties and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design steel support structures and concrete foundations 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 no more than 12 months before start of scheduled welding work.
- C. Source Limitations: Provide all scoreboards, controllers, and accessories by a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.
- B. Do not deliver until installation space is enclosed and conditioned.
- C. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.
- D. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Exterior Scoreboards: Provide 5 year manufacturer warranty for scoreboards and accessories, from date of Substantial Completion.
 - 1. Wireless Controls: Provide 2 year manufacturer warranty, from date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS & MATERIALS

- A. Refer to drawings for sizes and locations, unless noted otherwise.
 - B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach scoreboards to support structure; comply with requirements of Contract Documents.
 - 1. Mounting Brackets: Provide S and J brackets, fabricated of minimum 5/16-inch thickness steel plate; size and spacing recommended by manufacturer for secure attachment of scoreboards to support structure.
 - 2. Provide bolts, anchors, and fasteners of non-corroding, tamper- and vandal-resistant materials; provide concealed anchorage to greatest extent possible.
 - C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.
 - D. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.
 - 1. Provide each scoreboard with all required control cable of length required, junction boxes, and other accessories for complete, functional installation. Coordinate with Division 26 electrical subcontractor for supply junction box location at base of each scoreboard.
 - E. Steel Support Structure and Foundations: Coordinate with Structural and Civil Drawings and as follows:
 - 1. Concrete: ASTM C150/C150M; minimum 3,000 psi concrete.
 - 2. Structural Steel: ASTM A36/A36M steel sections or ASTM A500/A500M steel tubing, welded in accordance with AWS D1.1/D1.1M, using certified welders. Galvanize after fabrication to ASTM A123/A123M.
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2.02 FOOTBALL/TRACK/SOCCER SCOREBOARD

- A. Football/Track/Soccer Scoreboard: Provide the following multi-sport exterior scoreboard and accessories. All displays shall be LED.
1. (1) Exterior Scoreboard: Approximately 24'-0" wide by 8'-0" high by 8 inches deep, with integral horn and clock timer display to 1/100 second for track and when under one minute to play. Electrical: 120 V (60 Hz, 15A) electrical configuration.
 - a. Provide with manufacturer's standard "home" and "guest" captions.
 - b. Provide with "Down", "To Go", "Ball On", "Quarter", and "Time-Outs Left (T.O.L.)", and ball possession indicator accessory features.
 - c. Provide changeable panels to allow for scoring for track and soccer.
 - d. Digit Sizes: 30 inches (clock digits); 24 inches (home and guest scores); 18 inches (T.O.L. digits).
 - e. Scoreboard color shall be selected by Architect from manufacturer's standard range.
 - f. Products:
 - 1) Daktronics; Model # FB-2023. (Basis-of-Design)
 - 2) Fair-Play; Model # FB-8124TKH-2 (10" deep).
 - 3) Nevco; Model # 7631.

2.03 BASEBALL/SOFTBALL SCOREBOARDS

- A. Baseball/Softball Scoreboard: Provide the following exterior scoreboard and accessories. All displays shall be LED.
1. (1) Exterior Scoreboard: Approximately 25'-0" wide by 7'-0" high by 8 inches deep. Electrical: 120 V (60 Hz, 8A) electrical configuration.
 - a. Provide with manufacturer's standard "home" and "guest" captions.
 - b. Provide for inning by inning scoring for up to 10 innings; "Runs" and "Hits" total up to 99 and "Err" up to 9.
 - c. Provide with "At Bat", "H/E", "Ball", "Strike", and "Out", and ball possession indicator accessory features.
 - d. Digit Sizes: 15 inches (runs scored by inning and run/hit/error totals); 18 inches (At Bat, H/E, Ball/Strike/Out digits).
 - e. Scoreboard color shall be selected by Architect from manufacturer's standard range.
 - f. Products:
 - 1) Daktronics; Model # BA-2125. (Basis-of-Design)
 - 2) Fair-Play; Model # BA-7126-2 (26'-0" W by 6'-6" H).
 - 3) Nevco; Model # 1606 (24'-0" W by 8'-0" H).

2.04 CONTROL CENTERS

- A. (3) Controllers (one per scoreboard): Manufacturer's standard multi-sport wireless controller with protective case. Provide 120 V (6W, 60 Hz) electrical configuration. Provide with minimum 25 foot power cord.
1. Unit shall comply with FCC rules regarding interference.
 2. Receiver: Provide manufacturer's standard; approximately 6-inch by 4-inch nominal receiver box mounted at scoreboard.
 3. Range: Minimum 1,000 feet from control center to receiver.
 4. Adapter: Provide with adapter for each receiver for 120V input and 9V output.
 5. Products:
 - a. Daktronics; All Sport 5000.
-

- b. Fair-Play; MP-80.
- c. Nevco; MPCW-7.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.
- B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.
- C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.
- D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

- A. Install in accordance with Contract Documents and manufacturer's instructions.
- B. Install equipment rigid, straight, plumb, and level.
- C. Clearances:
 - 1. Install scoreboards at height required to clear fence height or as indicated on Drawings, but with not less than 10 feet between grade level and bottom of scoreboard.
 - 2. Provide a minimum of 36 inches clearance behind scoreboard to allow access to panel doors.
- D. Secure equipment with manufacturer's recommended anchoring devices.
- E. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

- A. Verify proper placement of equipment.
- B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.
- C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.
- D. Field Quality Control: Field test each scoreboard with manufacturer's representative; ensure that all scoreboard functions operate correctly. Provide adjustments as required.

3.04 DEMONSTRATION AND TRAINING

- A. Demonstration and Training: Demonstrate and provide training on operation and maintenance of each type of scoreboard to Owner's personnel.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at Project site using installed scoreboards.

3.05 CLEANING

- A. Remove masking or protective covering from finished surfaces.
- B. Clean equipment in accordance with manufacturer's recommendations.

3.06 PROTECTION

- A. Protect installed products until Date of Substantial Completion.
- B. Replace damaged products before Date of Substantial Completion.

END OF SECTION 116843

**SECTION 122400
WINDOW SHADES**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- D. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
 - 2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- C. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
 - 1. Motorized Shades: Include power requirements and standard wiring diagrams for specified products.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
 - 1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
- C. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Selection Samples: Include fabric samples in full range of available colors and patterns.
 - 1. Motorized Shades: Include finish selections for controls.
- F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

- H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized installation representative of fabricator/manufacturer.

1.05 MOCK-UP

- A. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following minimum terms:
 - 1. Manual Operating Mechanism / Clutch: 10 years, minimum (excludes bead chain).
 - 2. Fabric: 10 years, minimum.
 - 3. Balance of Shade Hardware and Non-Operating Materials and Components: 25 years, minimum.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc; Clutch Operated FlexShade.
 - 2. Hunter Douglas Architectural; RB500 Manual Roller Shades.
 - 3. Lutron Electronics Co., Inc; Contract Roller Manual Roller Shades.
 - 4. MechoShade Systems LLC; Mecho/5 System.
 - 5. WT Shade; HeliaRise.
 - 6. Substitutions: See Section 016000 - Product Requirements.
 - B. Interior Motorized Roller Shades, Motors and Motor Controls:
 - 1. Draper, Inc; Motorized FlexShade.
 - 2. Hunter Douglas Architectural; RB500 Motorized Roller Shades.
 - 3. Lutron Electronics Co., Inc; Contract Roller Motorized Roller Shades.
 - 4. MechoShade Systems LLC; Electroshade.
 - 5. WT Shade; MotoRise.
 - 6. Substitutions: See Section 016000 - Product Requirements.
 - C. Source Limitations: Provide products produced by a single manufacturer and obtained from a single supplier.
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2.02 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.
3. Motorized Shades: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed or recognized to UL 325.
 - a. Comply with NFPA 70.
 - b. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Where applicable, system components to be FCC compliant.
 - c. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view; fully compatible with controls to be installed.

B. Roller Shades:

1. Description - Interior Roller Shades: Single or double roller as indicated, fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - a. Drop Position: Regular roll.
 - b. Roll Direction: Roll down, closed position is at window sill.
 - c. Mounting: Window jamb mounted - inside, between jambs.
 - d. Size: As indicated on drawings for rough opening sizes; field verify rough openings prior to fabrication.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
 - 1) Light-Filtering Fabric: Room-side of opening.
 - 2) Room-Darkening Fabric: Glass-side of opening.
 - b. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using a single clutch operator.
 3. Roller Tubes: As required for type of shade operation.
 - a. Material: Extruded aluminum, clear anodized finish or electrogalvanized/epoxy primed steel, as standard with manufacturer.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize manufacturer's standard method for attaching shade fabric material to rollers.
 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 5. Manual Operation for Interior Shades:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.
 6. Accessories:
 - a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.
-

- 1) Color: As selected by Architect from standard range.
- b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.
- c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

- A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 1. Products (Light-Filtering):
 - a. Lutron Electronics Co., Inc; Basketweave 27 - 3% .
 - b. Mermet Corporation; E-Screen - 3%.
 - c. Phifer, Inc; Style 2410 3%.
 - d. Substitutions: See Section 016000 - Product Requirements.
 2. Products (Blackout):
 - a. Lutron Electronics Co., Inc; Standard Blackout - 0%.
 - b. Mermet Corporation; Avila Twilight - 0%.
 - c. Phifer, Inc; Style 7000 Blackout - 0%.
 - d. Substitutions: See Section 016000 - Product Requirements.
 3. Material: Vinyl coated fiberglass.
 4. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 - b. Fungal Resistance: No growth when tested according to ASTM G21.
 5. Color: To be selected by Architect from manufacturer's full range.
 6. Fabrication:
 - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
 - b. If height of opening requires multiple panels of railroaded fabric, use manufacturer's standard sewn seams.

2.04 MOTOR CONTROLS

- A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- B. Provide all components and connections necessary to interface with other systems as indicated.
- C. Electric Controls:
 1. Control Functions:
 - a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
 - b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
 - c. Presets: For selection of predetermined shade positions.
 2. Wall Controls: Provided by shade manufacturer.
 - a. Finish: Match other electrical wall plates; coordinate with Division 26 electrical.

2.05 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
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- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/4 inch maximum space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb, with maximum 1/4 inch gap at each edge of jamb.
- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at storefront/curtainwall mullion centers; butt rollers end-to-end, with no more than 1/2 inch gap between fabric.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

- A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.
- B. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at Project location.

3.07 PROTECTION

- A. Protect installed products from subsequent construction operations.

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

END OF SECTION 122400

SECTION 123553.19
WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.01 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.02 REFERENCE STANDARDS

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- B. ASTM C1036 - Standard Specification for Flat Glass.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- E. BHMA A156.9 - Cabinet Hardware.
- F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
- G. ICC (IFC) - International Fire Code.
- H. NFPA 1 - Fire Code.
- I. NFPA 30 - Flammable and Combustible Liquids Code.
- J. SEFA 2 - Installations.
- K. SEFA 8W - Laboratory Grade Wood Casework.
- L. SEFA 11 - Liquid Chemical Storage Cabinets.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of casework with related items.
 - 1. Service Fixtures: Coordinate location and characteristics of service connections.
 - a. Equipment and Instruments: Coordinate installation of casework with equipment and scientific instruments.
 - b. Electrical: Lab casework supplier shall provide electrical boxes and furnish receptacles, devices, and covers indicated to be mounted within laboratory casework. Div 26 contractor shall provide final installation and wiring.
 - c. Data: Install cut-outs, electrical backbox, and raceway for data service items furnished by Div 26 contractor. Div. 26 contractor shall provide data plates and wiring.
 - 2. Equipment and Instruments: Coordinate installation if casework with equipment and scientific instruments.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

- C. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.04 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any.
- C. Samples For Color Selection: Wood samples, fully finished, for color and species selection. Minimum Sample Size: 2 inches by 3 inches.
- D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- E. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for cabinet finish and liner materials.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- I. Finish touch-up kit for each type and color of materials provided.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with SEFA 8W certification for wood casework.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.
- C. Quality Certification:
 - 1. Provide designated labels on shop drawings as required by certification program.
 - 2. Provide designated labels on installed products as required by certification program.
 - 3. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
 - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
 - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" paragraph of this section.

1.07 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, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration, or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Laboratory Casework:
 - 1. Diversified Woodcrafts.
 - 2. Institutional Casework Inc (ICI Scientific).
 - 3. Kewaunee Scientific Corp.
 - 4. Leonard Peterson & Co., Inc.
 - 5. Mott Manufacturing.
 - 6. Stevens Industries.
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 WOOD LABORATORY CASEWORK

- A. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
 - 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 - 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 - a. Base Cabinets: 22 inches.
 - b. Tall Cabinets: 22 inches.
 - c. Upper Cabinets: 16 inches.
 - 3. Construction: Joints doweled, glued and screwed, except drawers may be lock-shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
 - 4. Glazing: Type and thickness standard with manufacturer.
 - a. Framed Doors: Tempered glass, with gaskets and removable stops; minimize rattling and vibration.
 - 5. Fittings and Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
 - 6. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.
 - 7. Fixed panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
 - a. Cutouts for power receptacles where indicated on drawings.

PENDER COUNTY SCHOOLS K-8 SCHOOL
PENDER COUNTY, NC
Architect's Project No.: 631310

8. ADA Sink Cabinets: Provide casework manufacturer's standard hinged front door panels, with matching veneer/cladding material and toe kick built into door panels, to match appearance of adjacent base cabinets. Front door panels swing open to 160 degrees minimum to allow for ADA-compliant undercounter knee space and for plumbing access to sink.
9. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
10. Factory-finish all exposed and semi-exposed surfaces with the same finish.
 - a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
 - 1) Hot water at temperature between 190 degrees F and 205 degrees F trickled down the test surface at 45 degree angle for 5 minutes.
 - 2) Constant moisture in the form of 2 by 3 by 1 inch thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
 - b. Preparation: Wood sanded smooth, free from dust and mill marks.
 - c. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
 - d. Coats: Multiple coats as required to achieve minimum 1.5 mil dry film thickness.
 - e. Appearance: Clear satin gloss; not cloudy or muddy.
- B. Solvent (Flammable and Combustible Liquids) Storage Cabinets: Pre-fabricated steel cabinets, complying with the following:
 1. Basis of Design: SciMatCo Jumbo Stacking cabinet SC8079, SC8082
 2. Construct to NFPA 30 and applicable OSHA requirements.
 3. Comply with SEFA 11.
 4. Fire Resistance: Maximum internal temperature of 325 degrees F at the center, and 1 inch from top of the cabinet when cabinet is subjected to a ten minute fire test that simulates fire exposure of a standard time-temperature curve specified in ASTM E119.
 5. Shelves: Full depth, adjustable.
 6. Bottom Pan: 2 inches deep, corrosion-resistant, liquid-tight pan covering entire bottom of cabinet.
 7. Cabinet Hardware: UL-listed.
 - a. Hinges: Full-length stainless steel continuous (piano) hinges.
 - b. Self-closing Doors: Comply with requirements of NFPA 1 and ICC (IFC). Minimum 90 degree opening. Three-point latch arrangement, door(s) shutting and latching automatically when hold-open device's fusible link melts at 165 degrees F under fire conditions outside the cabinet. At pair of doors, synchronize latching so that both doors always fully close.
 - c. Door Handles: Manufacturer's standard, with slip-resistant grip.
 - 1) Provide manufacturer's standard cylinder lock and key set.
 8. Signage: Provide manufacturer's standard signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.

2.03 CABINET HARDWARE

- A. Comply with BHMA A156.9 requirements.
 - B. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
 1. Hinged Doors: Cam type lock, bright chromium plated over nickel on base material.
-

2. Tall Hinged Doors: Three-point latching system.
 3. Keying: Key locks alike within a space; key each room separately.
 4. Master Key System: All locks operable by master key.
- C. Shelves in Cabinets:
1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.
- D. Swinging Doors:
1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.
 - a. European-Style Hinges: For overlay doors, concealed. Steel, nickel-plated, 110 degree opening angle.
 2. Catches: Magnetic.
 3. Pulls: Chrome wire pulls, 4 inches wide.
- E. Drawers:
1. Pulls: Chrome wire pulls, 4 inches wide.
 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.04 COUNTERTOPS

- A. Countertops:
1. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
 - a. Flat Surface Thickness: 1 inch, nominal.
 - b. Surface Finish: Smooth, non-glare.
 - c. Color: Black.
 - d. Exposed Edges and Corners: Beveled or radiused approximately 3/16 inch.
 - e. Drip Edge: Drip groove 1/8 inch wide and deep, located 1/2 inch back from edge on underside of each exposed edge.
 - f. Back and End Splashes: Same material, same thickness; separate for field attachment.
 - g. Sinks: Provide drop-in type epoxy sink, fabricated by same manufacturer as countertop. Sizes and outlet locations as indicated on drawing. Coordinate cut-out and routing in accordance with manufacturer's fabrication instructions and install to countertop with recommended chemical resistant sealing compound or adhesive.

2.05 MISCELLANEOUS LAB CASEWORK AND ACCESSORIES

- A. Demonstration Station: Prefabricated unit with locking base cabinets and drawers, constructed of veneered plywood of species and finish matching built in wood casework; with 1 inch thick epoxy top. Provide in configuration and dimensions as indicated on Drawings, and with the following features:
1. Basis of Design Product: Sheldon Labs Infinity Straight Teacher Demonstration Center #27500 with adjustable height worksurface. Refer to Drawings for sink location.
 2. Mobile Unit: Provide with heavy duty, locking, 4-inch ball-bearing casters.
 3. Dimensions: 8'-0" long by 2'-6" deep. 30-36" high (adjustable). Sitting desk shall have ADA compliant knee space.
 4. Countertop and Sink: Epoxy resin, with drop-in sink

5. Apparatus Rod/Greenlaw Arm Assembly: Adjustable aluminum assembly with either one or two vertical rods and corresponding sockets in epoxy top, per manufacturer's standard assembly, and with horizontal crossrod and clamping hardware.
 6. Power: 120V duplex outlet, with a minimum 9 foot long extension cord.
 - a. Contertop adjustment shall be wired to 120V power, with keyed puh-button operation and safety limit switch, manual adjustment methods are not acceptable
 7. Provide service access panela as required to maintain access to all services and utility connections.
- B. Pegboards: Epoxy pegboards with pre-drilled or punched holes in a staggered pattern, designed to accept removable white polypropylene pegs. With each pegboard include a stainless steel drip-trough with drain outlet and matching diameter 36 inches long PVC drain hose.
1. Size: 30 inches wide by 30 inches high.
- C. Goggle Cabinet: Wall-mounted steel reinforced cabinet designed to store and sanitize protective goggles. Unit shall have automatic timer control that operates a germicidal lamp to sanitize goggles. Unit shall be fully factory assembled and pre-wired and doors shall be equipped with locks. Unit shall measure 24-1/2 inches wide by 32 inches high by 9-1/2 inches deep and have manufacturer's standard baked enamel finish.
- D. Fire Blanket and Cabinet: Pre-fabricated steel cabinet with baked enamel finish and the lettering "FIRE BLANKET". Cabinet shall contain a minimum 62-inch by 80-inch woven blanket treated with fire-resistant chemicals to conform to Federal Specification #CS-191-53. Cabinet shall be drop type with hinged bottom panel and manual release. Mount cabinet such that release mechanism is less than 48 inches above floor.

2.06 MATERIALS

- A. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
 2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.
- B. Exposed Solid Wood: Clear, dry, sound, selected for compatible grain and color, no defects.
1. Wood Species: White maple; plain sliced.
- C. Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade A, same species as exposed solid wood, clear, compatible grain and color, no defects; minimum 1/50 inch thick. Band exposed edges with Grade J solid wood of same species as veneer.
- D. Semi-Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade B or C, any species similar in color and grain to exposed portions. Band exposed edges with Grade J solid wood of same species as veneer.
- E. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.
- F. Solid Epoxy Resin: Modified epoxy resin and non-asbestos inert fillers cast into sheets.
- G. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered and complying with ANSI Z97.1; 3/16 inch thick minimum; clear.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site Verification of Environmental Conditions:
1. Do not deliver casework until the following conditions have been met:

- a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. Verify adequacy of support framing and anchors.
- C. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- 1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
 - 2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
 - a. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
 - b. Maximum Variation of finished gypsum board surface from true flatness exceeds 1/8 inch in 10 feet in any direction.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
- 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Secure upper and floor cabinets to concealed reinforcement at gypsum board assemblies.
- G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- H. Wall Cabinets: Secure wall cabinets at top and bottom, at each end and no more than 16 inches on center. Secure directly into metal wall framing, or into FRT wood or metal channel blocking with No. 10 wafer head screws. Wall mounted hanger strips are not acceptable.
- I. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- J. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
- 1. Install vent kits and connect to fume hood exhaust system.
 - 2. Use only rigid materials for venting. No flexible materials permitted.

- K. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.
- L. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.04 CLEANING

- A. Clean casework and other installed surfaces thoroughly.

3.05 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.
- C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 123553.19

SECTION 123583
MUSIC EQUIPMENT STORAGE CASEWORK & ACCESSORIES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.02 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program.
- B. BHMA A156.9 - Cabinet Hardware.
- C. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board.
- D. NEMA LD 3 - High-Pressure Decorative Laminates.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors, reinforcements, and blocking, placement dimensions and tolerances, clearances required, and keying information.
 - 1. Include utility locations and connection requirements.
- C. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- D. Finish touch-up kit for each type and color of materials provided.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with capacity to fabricate either standard or custom music casework to the requirements indicated in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Instrument cabinetry and shelving shall have a ten year factory warranty from Date of Substantial Completion. Cover defects in materials and workmanship. Defects include, but are not limited to:
1. Ruptured, cracked, or stained finish coating.
 2. Discoloration or lack of finish integrity.
 3. Cracking or peeling of finish.
 4. Delamination of components.
 5. Failure of adhesives.
 6. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Wenger Corp.; AcoustiCabinets and UltraStor cabinets; models as indicated on Music Casework Schedule.
- B. Subject to conformance with specifications, including features not standard to the manufacturer, the following manufacturers may provide products for this project, subject to submittal and approval by Owner and Architect of samples of materials, construction features, and finishes as stipulated in the Design Requirements paragraph below.
1. Corilam.
 2. Melhart Storage Solutions.
 3. TMI Systems Corporation.
- C. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.02 THERMALLY FUSED LAMINATE MUSIC CASEWORK

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Thermally Fused Laminate Music Casework: Custom Grade.
- C. Design Requirements:
1. Provide music storage cabinets specifically designed and intended for use with musical instruments. Storage units shall be chip and abrasion resistant under heavy usage and shall protect instruments and cases from damage under normal use.
 2. Construction, General: Thermally fused laminate panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets. Include integral toe-kick, finished to match adjacent paneling.

- a. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on Drawings and Music Casework Schedule, and per Basis-of-Design models indicated.
3. Shelving: Provide minimum 3/4-inch thick high strength instrument shelving with scuff-resistant plastic surface, with integral profiled surface for ventilation, with radiused (bullnose) front edge, designed and engineered to withstand continuous use without surface or front edge breakdown.
 - a. Loading: Each shelf shall be able to independently and safely support 200 lbs minimum, uniformly distributed, with maximum deflection of L/144.
 - b. Shelving to be adjustable for flexibility
4. Paneling: Manufacture instrument cabinet with 3/4-inch composite panels finished with thermally-fused laminate (melamine) or polyester laminate, meeting performance requirements of NEMA LD 3 for VGS grade, both faces; and edge banded with 3 mm radiused PVC. Factory jig and drill end panels to accept unit-to-unit through bolting; wood screw attachment is not acceptable.
 - a. Rear Panels: Provide rear panels fabricated of minimum 1/4-inch MDF, fully captured all four sides, or 1/2-inch particleboard full overlay. For all cabinets with wire grille doors or open interior (no doors), provide acoustically absorptive material on inside face of rear panels.
 - b. Panel Colors: Exterior panel colors and edge bandings shall be selected from manufacturer's full range. Interior panel shall be manufacturer's standard white melamine.
5. Wire Grille Doors: Provide inset style, wire grille doors as indicated; reveal or full overlay style doors are not acceptable. All hinges shall be structurally attached to vertical cabinet panels with engineered and tested through-bolt hardware, and integrally welded to wire grille doors. Screw mounted hinges are not acceptable.
 - a. Loading: Wire-grille door hinge welded connections shall be tested and shall resist 400 lbf pull test without visible damage or permanent deformation.
 - b. Doors to include locks
 - c. Heavy-duty 5 knuckle institutional ANSI/BHMA A159.9 Grade 1, through-bolted to cabinet wall

2.03 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Hardware Application: Factory-machine casework members for hardware.
- D. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- E. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
- F. Mobile Cabinets: Same construction as fixed base cabinets, with modifications.
 1. Toe kick space eliminated.
 2. Cabinet underside reinforced as is standard with the manufacturer to provide caster mounting points.
 3. Four casters, each with a load rating of 165 pounds.

2.04 SPECIAL PURPOSE UNITS

- A. Music Library (Sheet Music) Storage: Manufacturer's standard, high-density, slide out type. Fabricate with 1-inch tube steel framing, powder-coated black color, with polyester laminate faced front and end panels, and with manufacturer's standard white melamine interior finish. Provide with manufacturer's standard casters. Provide 6-shelf units, with four adjustable shelves and two fixed shelves. Basis-of-Design is Wenger; Music Library System.
- B. Robe/Uniform Storage:
- C. Fixed Folio Cabinet:
- D. Mobile Band/Orchestra Folio:

2.05 CABINET HARDWARE

- A. Comply with BHMA A156.9 requirements.
- B. Label Holders: Manufacturer's standard, sized to hold standard label cards, bright chromium plated over nickel on base material.
- C. Swinging Doors: Hinges, latches, and joinery.
 - 1. Hinges: Number as required by manufacturer and by referenced standards for width, height, and weight of door.
 - a. Hinges: BHMA A156.9, Grade 1 butt hinges; powder coated to match grille door.
 - 1) Hinges shall be installed with through-bolts to cabinet side panels; five-knuckle, projecting barrel, minimum 2-1/2 inches long.
 - 2) At wire-grille doors, weld hinges to door panels.
 - 3) At solid composite wood doors, through-bolt hinges to door panels.
 - 2. Latch and Locks: Provide manufacturer's standard slide or gravity latch, steel construction, with integral padlock eye and powder-coat finish. All doors shall latch securely without padlock; doors with padlock hasp only are not acceptable.
 - a. Padlocks: NIC. Shall be provided by Owner.

2.06 MATERIALS

- A. Composite Wood: Tested and certified to CARB (ATCM) requirements for ultra-low emitting formaldehyde (ULEF) resins.
- B. Thermally Fused Laminate (TFL): Melamine or polyester resin, NEMA LD 3, Type VGS laminate panels.

2.07 ACCESSORIES

- A. Plastic Edge Banding: Extruded 3mm PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: Match adjacent laminate.
 - 2. Use at exposed edges.
- B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.
- C. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Cabinet Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. Verify adequacy of support framing and anchors.
- D. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
 - B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
 - C. Set casework items plumb and square, securely anchored to building structure.
 - D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
 - E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
 - F. Secure cabinets to concealed reinforcement and blocking where installed to gypsum board partition assemblies.
 - G. Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.
 - H. Install hardware uniformly and precisely.
-

- I. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- J. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

- A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 123583

SECTION 125600
METAL WORKTABLES - FREESTANDING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM 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.

1.02 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, and attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- B. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section during handling and installation, including finished surfaces and hardware items. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Accept worktable on site. Inspect on arrival for damage.
- C. Coordinate size of access and route to place of installation.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer Warranty: Provide 10 warranty against defects. Complete forms in Owner's name and register with manufacturer. Covered defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Failure of hardware.

PART 2 PRODUCTS

2.01 FABRICATION

- A. Assembly: Shop assemble worktables for delivery to site in units easily handled and to permit passage through building openings.

2.02 SPECIAL PURPOSE UNITS

- A. Stainless Steel Work Table at Laundry Room:
 - 1. Applications: Uses including freestanding laundry worksurface.
 - 2. Type: Table with fixed-height worksurface.
 - 3. Primary Components: Manufacturer's standard; consisting of cantilevered base frame, worksurface support frame, and worksurface.
 - a. Cantilevered Base Frame: Each base frame equipped with a pair of polypropylene casters, each with brake and swivel lock.
 - b. Worksurface Support Frame: Telescoping from base frame.
 - c. Worksurface: Stainless steel.
 - d. Bottom Shelf: Stainless steel.
 - 4. Accessory Components: Manufacturer's standard.
 - a. Back Frame: Upright frame for mounting accessory components.
 - 1) Load Capacity: 250 lb, evenly distributed.
 - 2) Mounting: Bolted to back of worksurface support frame.
 - 3) Divider Uprights: Flexible locations for subdividing the back frame into smaller sections.
 - b. Footrest bar.
 - 5. Primary Metal Materials:
 - a. Tubing: Hot-rolled steel, ASTM A513/A513M.
 - b. Sheet Metal: Cold-rolled steel, ASTM A1008/A1008M.

2.03 WORKTABLE HARDWARE

- A. Manufacturer's standard types, styles and finishes.

2.04 MATERIALS

- A. General: Manufacturer's standard materials for units specified, unless otherwise indicated.
- B. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, CS or FS Type B, with G90/Z275 coating; stretcher leveled.
- C. Stainless Steel Sheet: ASTM A666 Type 304.

2.05 FINISHES

- A. Stainless Steel: No. 4 finish.
- B. Shop finish all components.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install worktable, components and accessories in accordance with manufacturer's instructions.
- B. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- C. Field touch-up blemishes to original finish.

3.02 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, fixtures to function smoothly.
-

3.03 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean table worksurface, shelves, legs, hardware, fittings and fixtures.

3.04 PROTECTION

- A. Do not permit finished worktables to be exposed to continued construction activity.
- B. Protect worktables from ongoing construction activities. Prevent installers from standing on or storing tools and materials on table worksurface.
- C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 125600

**SECTION 126600
TELESCOPING STANDS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- C. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- D. NFPA 102 - Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures.
- E. PS 1 - Structural Plywood.

1.02 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage handling and requirements.
 - 3. Installation methods.
- B. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
 - 1. Provide drawings customized to this project.
 - 2. Delegated Design: Include Professional Engineer certification and engineering analysis data.
 - 3. Wiring Diagrams: Show locations of motors, electrical wiring, and rough-in connections.
- C. Selection Samples: Provide manufacturer's color charts indicating full range of available colors.
- D. Verification Samples: Physical samples, manufacturer's standard size, for each selected color.
- E. Operation and Maintenance Data: Manufacturer's operation and maintenance instructions, including annual inspection and maintenance and bi-annual inspection by a Professional Engineer or manufacturer factory service personnel.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 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: Manufacturer's installation crew.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store, in original packaging, under cover and elevated above grade.

1.05 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. Replace parts that fail under normal use at no extra charge to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Telescoping Bleachers:
 - 1. Interkal LLC.
 - 2. Irwin Telescopic Seating Company.
 - 3. Hussey Seating Company.

2.02 TELESCOPING BLEACHERS

- A. Telescoping Bleachers: Factory assembled tiered benches that retract horizontally into depth approximately the same as a single row depth, with fixed seats mounted on leading edge of platforms.
 - 1. Delegated Design: Provide telescoping stands certified by a licensed Professional Engineer for the performance and design requirements indicated.
 - 2. Design to comply with applicable requirements of NFPA 102 and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.
 - 3. Design with solid fascia (riser) or seat fronts that conceal interior mechanisms when fully retracted, fitting tightly enough to prevent climbing up face; at front row provide key locked, hinged fascia (skirt) to cover gap between seat riser/fascia and floor.
 - 4. Standard Extension: Top row fixed to floor, adjacent to wall, forward extension (away from wall); attachment to wall acceptable.
 - 5. Configurations: As indicated on drawings.
 - 6. Wheelchair Spaces: Allow portions of first row, as indicated, to be manually retracted without affecting other rows; provide removable railings at row two behind wheelchair spaces in compliance with ADA Standards.
 - 7. Operation: Motor operated.
- B. Design Loads: Design to withstand the following loading conditions:
 - 1. Live Load on Structural Supports: 100 psf, minimum, of gross horizontal projection.
 - 2. Live Load on Seats and Walking Surfaces: 120 pounds per linear foot.
 - 3. Lateral Sway Stress on Structural Supports: 24 pounds per linear foot of seat plank.
 - 4. Perpendicular Sway Stress on Structural Supports: 10 pounds per linear foot of seat plank.
- C. Dimensions:
 - 1. Rows: As indicated on drawings.
 - 2. Rise Per Row: 10 inches.
 - 3. Row Depth: 22 inches.
 - 4. Seat Height Above Tread: 6 inches.
- D. Structural Supports: Steel or aluminum; manufacturer's standard wheeled carriages supporting each tier separately, with moving parts permanently lubricated and metal parts cushioned to prevent metal-to-metal contact during operation.
 - 1. Design so that each row carriage so that it will individually support the design loads and is self supporting when fully assembled without dependence on platform panels or boards, seats, or fascia.
 - 2. Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.
 - 3. Bolting: Use lock-washers or locknuts.

4. Wheels: Minimum 5 inch diameter by 1-1/8 inch wide, with non-marring rubber tires; ball, roller, or oil-impregnated metal bearings; minimum of 2 wheels at each floor support.
 5. Finish: Manufacturer's standard black enamel or powder coating.
 6. Row Locking: Automatically mechanically lock each carriage to adjacent carriages when fully extended.
 7. Unlocking: Automatically unlock all rows before engaging retraction mechanism.
- E. Motor Operation: Manufacturer's standard drive mechanism, using motor adequately sized for the purpose.
1. Provide UL listed electrical components and wiring.
 2. Controls: Start, Stop, Forward, and Reverse in a single control unit.
 3. Control Station: Removable plug-in low-voltage pendant station, with first-row plug-in location for each motor.
 4. Limit Switches: Automatically stop operation when unit has reached fully open or fully closed position.
 5. Provide all wiring internal to bleacher units, to junction box located where indicated; ensure that wiring is not energized except during operation.
 6. Electrical Characteristics: 208/230V, 5 wire, 3-phase, 60 Hz.
 7. Provide access to motor from front side of bleachers; a hinged front skirt or hinged section at least 30 inches wide is acceptable.

2.03 SEAT AND PLATFORM COMPONENTS

- A. Seat/Fascia Assembly: Continuous, molded UV-stabilized high-density polyethylene plastic, seat minimum 1 inch thick, textured finish, homogeneous color throughout, color as selected from manufacturer's standard selection; approximately 18 inch long sections independently removable with tongue-and-groove or rabbeted interlock at end joints.
1. Shape: Ergonomically contoured, with internal ribs spaced for natural flexibility; rear edge cantilevered to provide toe room of not less than 3 inches; no openings to trap debris.
 2. Provide end caps of same material and finish on each exposed end.
 3. Supports: Internal steel reinforcement of each seat segment bolted to platform nose member; minimum two bolts per segment.
- B. Platform, Tread, and Step Structure: Plywood continuously supported on front and rear with side joints tongue-and-grooved.
1. Plywood: PS 1, 5-ply southern pine or douglas fir, Grade A-C.
 2. Plywood Thickness: 5/8 inch, minimum.
 3. Front (Nose), Rear, and Intermediate Supports: Steel channel or tube, hot-dipped galvanized.
 4. Provide end caps of same material and finish on each exposed end.

2.04 HANDRAILS AND RAILINGS

- A. Provide the following railings:
1. Aisle Handrails: Single post folding railing segment mounted in center of aisle at every other row beginning at row 2.
 2. End of Row Guardrails: Self-storing, at open ends of sections beginning at row 2.
 3. Height: 42 inches above adjacent platform or tread.
- B. Design handrails and railings to withstand the following loads:
1. Concentrated Load on Handrails: 200 pounds in any direction.
 2. Concentrated Load on Guardrails: 200 pounds in any direction along top rail.

3. Live Load on Handrails: 50 pounds per linear foot, applied in any direction.
4. Live Load on Guardrails:
 - a. Horizontal: 50 pounds per linear foot, applied at the guardrail height.
 - b. Vertical: 100 pounds per linear foot, applied vertically to top of guardrail.
- C. Railing Construction: Round steel or aluminum pipe or tube, with formed elbows at corners and caps at ends of straight runs.
 1. Aluminum: 1.66 inches minimum outside diameter; natural anodized finish.
 2. Steel: 1-1/2 inch minimum outside diameter, with 11 gauge, 0.12 inch minimum wall thickness; textured powder coat epoxy finish.

2.05 ACCESSORIES

- A. Fillers and Closures:
 1. Top Row: Provide seat level rear filler panels to close openings between top row seat and wall; finish to match platforms.
 2. Sides of Extended Units: Vinyl curtains.
 3. Vinyl Curtains: 18 ounce vinyl with grommets; color as selected from manufacturer's standard palette.
- B. Fasteners: Provide hardware and fasteners in accordance with manufacturer's recommendations.
- C. Anchorage: As indicated on drawings; provide hardware in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are consistent with those on the shop drawings.
- B. Verify that electrical rough-ins have been installed and are accessible.
- C. Do not begin installation until substrates have been properly prepared and area has been cleared of obstructions.
- D. 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 the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Do not field cut or alter seats, fascia, or structural members without approval.
- C. Provide manufacturer's field representative to inspect completed installation.

3.04 ADJUSTING

- A. Lubricate, test, and adjust each moving assembly to ensure proper operation in compliance with manufacturer's recommendations.

3.05 CLEANING

- A. Clean exposed and semi-exposed assembly surfaces.
- B. Touch up finishes on damaged or soiled areas.

3.06 CLOSEOUT ACTIVITIES

- A. Demonstration and Training: Provide manufacturer's field representative to demonstrate to and train Owner's operating personnel in proper operation of equipment.
 - 1. Location: On site using installed equipment.

3.07 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 126600

**SECTION 142400
HYDRAULIC ELEVATORS**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. AISC 360 - Specification for Structural Steel Buildings.
- C. 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.
- D. 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, and Dumbwaiters.
- E. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.
- F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- J. ITS (DIR) - Directory of Listed Products.
- K. NEMA LD 3 - High-Pressure Decorative Laminates.
- L. NEMA MG 1 - Motors and Generators.
- M. NFPA 70 - National Electrical Code.
- N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- O. PS 1 - Structural Plywood.
- P. UL (DIR) - Online Certifications Directory.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate work with other installers for construction of hoistway to ensure hoistway is built to elevator manufacturer's requirements, including but not limited to, the following:
 - a. Concrete work for elevator pit depth, hoistway size, and sump requirement.
 - b. Masonry and/or metal framing and gypsum shaft wall for hoistway size, wall depth, and fire rating.
 - c. Metal fabricator for sizing and location of hoist beam.
 - 2. 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 hoistway.
 - b. Emergency communication service.
 - c. Elevator pit for lighting and sump pump.
 - d. Automatic transfer switch.

- e. Fire alarm panel.
- 3. 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.
 - c. Overcurrent protection devices selected to achieve required selective coordination.
- 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(s): Not permitted.

1.03 SUBMITTALS

- A. Product Data: Submit data on following items:
 - 1. Signal and operating fixtures, operating panels, and indicators.
 - 2. Car design, dimensions, layout, and components.
 - 3. Car and hoistway door and frame details.
 - 4. Electrical characteristics and connection requirements.
- B. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
 - 1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
 - 2. Hoistway Components: Size and location of hoist beams, 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. Loads on hoisting beams.
 - 5. Clearances and over-travel of car.
 - 6. Locations in hoistway of traveling cables and connections for car lighting and telephone.
 - 7. Location and sizes of hoistway and car doors and frames.
 - 8. Interface with building security and access control systems.
 - 9. Electrical characteristics and connection requirements.
 - 10. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
- C. Samples: Submit samples illustrating car interior finishes in the form of cut sheets or finish color selection brochures.
- D. Designer's Qualification Statement.
- E. Installer's Qualification Statement.
- F. Testing Agency's Qualification Statement.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Initial Maintenance Contract.

- I. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract/war is scheduled to expire.
 - 1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.
- J. Operation and Maintenance Data:
 - 1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
 - 2. Operation and maintenance manual.
 - 3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing the work of this section and approved and certified by elevator equipment manufacturer.
- C. 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.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.
- E. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
- F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's warranty for elevator operating equipment and devices for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers (provide substitution request with full data per requirements below):
 - 1. Alliance Elevator Solutions.
 - 2. Otis Elevator Company.
 - 3. Schindler Elevator Corporation.
 - 4. TK Elevator.
- B. Due to variations between manufacturers, the submitting manufacturer shall provide a complete submittal including all changes required to indicated design and requirements, including but not limited to: hoistway dimensions, pit depth, overhead height, hoist beam size, location, and configuration, electrical characteristics, motor size, and disconnects, controller and panel locations, and rated load and speed.

1. The manufacturer, Contractor, and Architect shall coordinate changes prior to the start of construction on the hoistway and pit. The Architect shall incorporate changes into the documents and re-issue for distribution to affected subcontractors.
2. Variations shall be accommodated at no additional cost to the Owner. The Contractor shall coordinate with all affected subcontractors during the bidding/pricing process to ensure accurate pricing for submitting elevator manufacturer and to ensure that all subcontractors are aware of potential variations in advance.

2.02 HYDRAULIC ELEVATORS

- A. Hydraulic Passenger Elevator:
 1. Hydraulic Elevator Equipment:
 - a. Holeless hydraulic with cylinder mounted within hoistway.
 2. Drive System:
 - a. Variable voltage variable frequency (VVVF) to modulate motor speed.
 3. Operation Control Type:
 - a. Selective Collective Automatic Operation Control.
 4. Service Control Type:
 - a. Standard service control only.
 5. Interior Car Height: 88 inch.
 6. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
 7. Rated Net Capacity: 2500 pounds.
 8. Rated Speed: 125 to 150 feet per minute.
 9. Hoistway Size: As indicated on drawings.
 10. Elevator Pit Depth: 60 inch.
 11. Overhead Clearance at Top Floor: 12' - 8" inch.
 12. Travel Distance and Stops: As indicated on drawings.
 13. Openings: Front only.
 14. Hydraulic Equipment Location: Adjacent to bottom of hoistway shaft.

2.03 COMPONENTS

- A. Elevator Equipment:
 1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70; refer to Division 26 and Electrical Drawings.
 2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
- B. Electrical Equipment:
 1. Motors: NEMA MG 1. Manufacturer shall size motor(s) specifically for this project to account for indicated load capacity, rated speed, and other factors as required.
 - a. Electrical characteristics are based on a 20 HP motor. If a different motor size is required, coordinate any necessary revisions to electrical supply with electrical contractor.
 2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70; refer to Division 26 and Electrical Drawings.
 3. Sump Pump in Pit: Refer to Division 22 and Plumbing Drawings.
 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. Refer to Division 26 and Electrical Drawings.

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.

2.05 OPERATION CONTROLS

- A. Elevator Controls: Provide landing operating panels and landing indicator panels.
 1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
 2. Landing Indicator Panels: Illuminating.
 3. Comply with ADA Standards for elevator controls.
- B. Interconnect elevator control system with building security, fire alarm, card access, smoke alarm, and building management control systems.
- C. Door Operation Controls:
 1. Program door control to open doors automatically when car arrives at floor landing.
 2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
 3. Door Safety Devices: Moveable, retractable safety edges, quiet in operation; equipped with photo-electric light rays.
- D. Emergency Communication: Provide two-way communication system mounted in a control panel that will connect elevator cab to outside monitoring service. Monitoring service shall be interactive and available live 24/7.
 1. Emergency system shall activate by push button and not require use of handset.
 2. Emergency system shall include visual, text-based, and video-based system, and with a voice-only option, that is accessible to deaf, hard-of-hearing, or visually impaired individuals in accordance with applicable edition of the IBC.

2.06 OPERATION CONTROL TYPE

- A. Single Automatic (Push Button) Operation Control: Applies to car in single elevator shaft.
 1. Refer to description provided in ASME A17.1.
 2. Set system operation so that momentary pressure of landing button dispatches car from other landing to that landing.
 3. Allow call registered by momentary pressure of landing button at any time to remain registered until car stops in response to that landing call.
 4. If elevator car door is not opened within predetermined period of time after car has stopped at terminal landing allow car to respond to call registered from other landing.

2.07 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.

2.08 MATERIALS

- A. Stainless Steel Sheet: ASTM A666, Type 304; No. 4 Brushed finish.
- B. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
- C. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.
- D. Plywood: PS 1, Structural I, Grade C-D or better, sanded.
- E. Flooring Finish: precast terrazzo; refer to Finish Schedule and applicable Division 9 flooring section.
- F. Plastic Laminate: NEMA LD 3, Type HGS, color as selected by Architect from manufacturer's standard line of colors.

2.09 CAR AND HOISTWAY ENTRANCES

- A. Elevator Car and Hoistway Entrances:
 - 1. Car and Hoistway Entrances:
 - 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: Brushed stainless steel, with rigid sandwich panel construction.
 - e. Hoistway Door Material: Brushed stainless steel, with rigid sandwich panel construction.
 - f. Door Operation: Side opening, two speed.
 - g. Door Width: 42 inches.
 - h. Door Height: 84 inches.
 - i. Sills: Extruded aluminum.
 - B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.
 - C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to eliminate audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.10 CAR EQUIPMENT AND MATERIALS

- A. Elevator Car Equipment and Materials:
-

1. Car Operating Panel: Provide main; flush-mounted applied face plate, with illuminated call buttons corresponding to floors served with "Door Open/Door Close" buttons and alarm button.
 - a. Panel Material: Integral with front return; one per car.
 - b. Car Floor Position Indicator: Above door with illuminating position indicators.
 - c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.
 2. Flooring: precast terrazzo, refer to Division 9.
 3. Front Return Panel: Stainless steel, brushed/satin finish to match door.
 4. Door Wall: Stainless steel, brushed/satin finish to match door.
 5. Side and Rear Walls: Plastic laminate on plywood.
 - a. Reveals Between Wall Panels: Stainless steel, to match front return panel/door. Align reveal/joint locations with ceiling panel joints.
 6. Hand Rail: Stainless steel with brushed/satin finish, at all three sides. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
 - a. Flat Bar Stock, Solid: 1/4 or 1/2 inch thick by 2 inch high.
 7. Ceiling: Suspended stainless steel ceiling panels with compact fluorescent or LED downlights centered in each panel.
- B. Car Accessories:
1. Certificate Frame: Stainless steel frame glazed with acrylic plastic, 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.
 - a. Pad Supports: Stainless steel studs, and mounted from top of wall panels.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting this work.
- B. Verify that hoistway, pit, and machine room are ready for work of this section.
- C. Verify hoistway shaft and openings are of correct size and within tolerance.
- D. Verify location and size of machine foundation and position of machine foundation bolts.
- E. Verify that electrical power is available and of correct characteristics.

3.02 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.

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; refer to Division 26 and Electrical Drawings.

- D. Install hydraulic piping between cylinder and pump unit.
- E. Mount machines, motors, and pumps on vibration and acoustic isolators.
 - 1. Place on structural supports and bearing plates.
 - 2. Securely fasten to building supports.
 - 3. Prevent lateral displacement.
- F. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.
- G. Install guide rails to allow for thermal expansion and contraction movement of guide rails.
- H. Accurately machine and align guide rails, forming smooth joints with machined splice plates.
- I. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.
- J. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.
- K. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.
- L. Adjust equipment for smooth and quiet operation.

3.04 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. Provide Acceptance Testing and inspections by regulatory agencies certified in accordance with ASME QEI 1.
 - 1. As a part of final acceptance of the project and in accordance with the General Conditions, the Contractor shall have a Qualified Elevator Inspector (QEI) conduct a full Acceptance Inspection and Test in accordance with ASME/ANSI A17.1 before final acceptance by the Owner. The Contractor shall obtain from the elevator contractor and/or manufacturer and furnish to the Owner all data affecting the elevator installation or modification, including "as-installed" circuit and control wiring diagrams and maintenance manuals.
 - 2. The elevator installer shall coordinate and participate with all tests, inspections, and approvals required by the building code, including but not limited to inspections by QEI, fire marshal and elevator inspector. The elevator installer shall attend and assist with tests, inspections, and approvals required by the building code at no additional cost to the Owner.
 - 3. Schedule tests with agencies and notify Owner and Architect.
 - 4. Obtain permits as required to perform tests.
 - 5. Document regulatory agency tests and inspections in accordance with requirements.
 - 6. Perform tests required by regulatory agencies.
 - 7. Furnish test and approval certificates issued by authorities having jurisdiction.

3.06 ADJUSTING

- A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.
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- B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch 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. See Section 017900 - Demonstration and Training for additional requirements.
- 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. 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. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 12 months from Date of Substantial Completion.
- B. Submit proposal for continuation of Maintenance Contract beyond the initial 12 month contract in accordance with ASME A17.1 and requirements as indicated for installed elevator equipment.
- C. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.
- D. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.
- E. Include systematic examination at maximum monthly intervals (12 visits total for initial contract). Examination shall include adjustment, lubrication, and other preventive maintenance, and repair or replacement of defective or worn parts or equipment. Monthly inspection shall include Phase II Fire Recall testing.
- F. Perform work without removing cars from use during peak traffic periods.
- G. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

END OF SECTION 142400
