Project Manual

Addendum No. 01 to Construction Document
Volume 01

COLLEGE OF
Osteopathic Medicine
AT THE CHEROKEE NATION

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CHILDERS ARCHITECT | HKS

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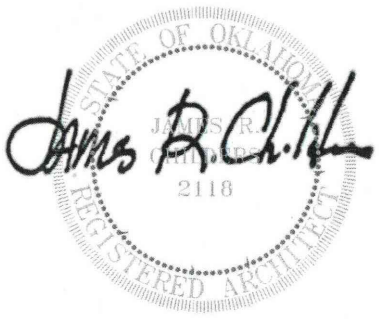
TABLE OF CONTENTS

LEGEND

First Column:	Current Date for Section
Second Column:	Checked Indicates Section is Included in Current Issue
Third Column:	Section Number
Fourth Column:	Section Title
Fifth Column:	Section Author



SEPT. 09, 2019

ISSUES

Bid Package 01, Demolition	**2019-01-18**	
Addendum No. 01 (to bid pack 01)	**2019-02-08**	
Bid Package No. 02, Rough Grading	**2019-02-08**	
Bid Package No. 03, Foundation	**2019-03-20**	
Bid Package No. 04, Underground Utilities-Steel	**2019-05-10**	
Construction Document	**2019-08-23**	**Issued for Construction**
Addendum No. 01 to Construction Document	**2019-09-09**	

NOTE FOR REVISED SPECIFICATION SECTIONS

1. DELETED INFORMATION IS INDICATED BY A STRIKETHROUGH (IE, ~~THIS IS DELETED~~).
2. NEW INFORMATION IS INDICATED BY A DOUBLE UNDERLINE (IE, THIS IS ADDED).
3. ALL REVISED INFORMATION IS FURTHER IDENTIFIED BY A HEAVY VERTICAL LINE TO THE RIGHT OF ALL REVISIONS IN EACH INDIVIDUAL SPECIFICATION SECTION (REFER TO HEAVY BOLD LINE TO THE RIGHT FOR AN EXAMPLE).

V O L U M E 1

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

	☐	02 4119	Selective Demolition

DIVISION 03 - CONCRETE

	☐	03 0150	Concrete Patching
2019-03-20	☐	03 1000	Concrete Forming and Accessories
	☐	03 1100	Concrete Forming
	☐	03 1500	Concrete Accessories
2019-03-20	☐	03 2000	Concrete Reinforcing
2019-03-20	☐	03 3000	Cast-In-Place Concrete
2019-08-23	☐	03 3500	Concrete Finishing
~~2019-08-23~~	☐	~~03 3543~~	~~Polished Concrete~~ **Section deleted as per discussion on 08.26.19**
	☐	03 3600	Special Concrete Finishes
	☐	03 3800	Post-Tensioned Concrete
	☐	03 4100	Plant-Precast Structural Concrete
2019-09-09	☒	03 4500	Architectural Precast Concrete
	☐	03 4713	Tilt-Up Concrete
	☐	03 4900	Glass-Fiber Reinforced Precast Concrete (GFRC)
	☐	03 5216	Lightweight Insulating Concrete
	☐	03 5300	Concrete Toppings
	☐	03 5416	Hydraulic Cement Underlayment

DIVISION 04 - MASONRY

	☐	04 2100	Masonry Veneer
2019-03-20	☐	04 2200	Concrete Unit Masonry
	☐	04 2300	Glass Unit Masonry
	☐	04 4200	Exterior Stone Cladding
	☐	04 4216	Steel Supported Stone Cladding
	☐	04 7200	Cast Stone Masonry
2019-08-23	☐	04 7500	Adhered Masonry Veneer

DIVISION 05 – METALS

2019-04-19	☐	05 1000	Structural Steel
	☐	05 1200	Structural Steel Framing
2019-04-14	☐	05 1213	Architecturally Exposed Structural Steel (AESS) Framing
	☐	05 1636	Barrier Cables
	☐	05 2100	Steel Joists Framing
2019-04-19	☐	053000	Metal Decking
	☐	05 3100	Steel Decking
	☐	05 3123	Steel Roof Deck System
	☐	05 3133	Permanent Metal Forming
2019-08-23	☐	05 4000	Cold-Formed Steel Framing
2019-08-23	☐	05 4300	Slotted Channel Framing
2019-08-23	☐	05 5000	Metal Fabrications
2019-05-10	☐	05 5100	Metal Stairs

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

	☐	07 3200	Roof Tiles
	☐	07 4114	Metal Roof Panels
2019-08-23	☐	07 4213	Formed Metal Wall Panels
	☐	07 4216	Modular Metal Wall Panels
	☐	07 4229	Terra Cotta Wall Panels
2019-08-23	☐	07 4243	Composite Metal Wall Panels
2019-08-23	☐	07 4244	Composite Wood Wall Panels
2019-08-23	☐	07 4623	Cedar Soffit Siding
2019-08-23	☐	07 4800	Rainscreen Attachment System
2019-08-23	☐	07 5013	Single-Ply Membrane Roofing
2019-08-23	☐	07 5216	Modified Bituminous Membrane Roofing
	☐	07 5556	Fluid-Applied Protected Membrane Roofing
	☐	07 5563	Vegetated Protected Membrane Roofing
2019-09-09	☒	07 6200	Flashing and Sheet Metal
2019-09-09	☒	07 7200	Roof Accessories
	☐	07 7600	Roof Pavers and Pedestal Assemblies
2019-08-23	☐	07 8116	Cementitious Fireproofing
	☐	07 8123	Intumescent Mastic Fireproofing
2019-08-23	☐	07 8413	Penetration Firestopping
2019-08-23	☐	07 8446	Fire-Resistive Joint Firestopping
	☐	07 9100	Preformed Joint Seals
2019-08-23	☐	07 9200	Joint Sealants
	☐	07 9500	Expansion Control

DIVISION 08 - OPENINGS

	☐	08 0610	Door Schedule
2019-08-23	☐	08 1113	Hollow Metal Doors and Frames
	☐	08 1114	Interior Hollow Metal Frames
	☐	08 1170	Steel Fire Door and Frame Assembly
2019-08-23	☐	08 1216	Interior Aluminum Frames
2019-08-23	☐	08 1416	Prefinished Flush Wood Doors
	☐	08 1433	Stile and Rail Wood Doors
2019-08-23	☐	08 3113	Access Doors and Frames
~~2019-08-23~~	☐	~~08 3213~~	~~Sliding Aluminum-Framed Glass Doors~~ **Section deleted as per discussion on 08.26.19.**
	☐	08 3313	Coiling Counter Doors
	☐	08 3323	Overhead Coiling Doors
	☐	08 3326	Overhead Coiling Grilles
	☐	08 3338	Interior Side Coiling Grilles
2019-08-23	☐	08 3400	Special – Function Doors
	☐	08 3470	Acoustical Metal Door, Window, and Frame Assemblies
	☐	08 3513	Folding Doors
	☐	08 3515	Accordion Folding Fire Doors
	☐	08 3613	Sectional Overhead Doors
2019-08-23	☐	08 3616	Barn All Glass Doors
2019-08-23	☐	08 4110	Interior Storefront
	☐	08 4127	Exterior All-Glass Entrances and Storefronts
	☐	08 4128	Interior All-Glass Entrances and Storefronts
	☐	08 4213	Exterior Aluminum Entrance Doors

2019-08-23	☐	08 4216	Interior Aluminum Entrance Doors
	☐	08 4229	Automatic Entrances
	☐	08 4233	Revolving Entrance Doors
2019-08-23	☐	08 4243	Medical Specialty Sliding Entrances
2019-08-23	☐	08 4400	Glazed Aluminum Framing Systems
	☐	08 4426	Structural Glass Curtainwall
	☐	08 4500	Translucent Insulating Panel Assemblies
	☐	08 5113	Aluminum Windows
2019-08-23	☐	08 5619	Sliding Pass Windows
	☐	08 5656	Bullet-Resistive Windows
	☐	08 6200	Unit Skylights
	☐	08 6300	Metal-Framed Skylights
2019-08-23	☐	08 7100	Door Hardware
	☐	08 7121	Interior Automatic Door Operators for Staff Use
2019-08-23	☐	08 7122	Automatic Door Operators for the Disabled
2019-08-23	☐	08 8000	Glazing
	☐	08 8300	Unframed Mirrored Glazing
2019-08-23	☐	08 8816	Between Glass Blinds Units
	☐	08 8840	Switchable Privacy Glass Units
	☐	08 9100	Wall Louvers

DIVISION 09 - FINISHES

	☐	09 0565	Floor Preparation for Renovation Work
	☐	09 0600	Room Finish Schedule
	☐	09 2300	Gypsum Plastering
2019-08-23	☐	09 2400	Portland Cement Plastering
	☐	09 2600	Veneer Plastering
	☐	09 2613	Gypsum Veneer Plastering
	☐	09 2713	GFRG Fabrications
2019-09-09	☒	09 2900	Gypsum Board Assemblies
2019-08-23	☐	09 3000	Tiling
2019-08-23	☐	09 5113	Acoustical Panel Ceilings
	☐	09 5133	Acoustical Metal Pan Ceilings
	☐	09 5135	Snap-in Metal Pan Ceilings
	☐	09 5423	Linear Metal Ceilings
	☐	09 5436	Suspended Decorative Grids
2019-08-23	☐	09 6115	Concrete Floor Sealer
	☐	09 6116	Liquid Floor Hardener
	☐	09 6119	Moisture Floor Treatment
	☐	09 6340	Stone Flooring
	☐	09 6400	Wood Flooring
2019-08-23	☐	09 6500	Resilient Flooring
2019-08-23	☐	09 6513	Resilient Base and Accessories
	☐	09 6520	Interlocking Rubber Tile Flooring
2019-08-23	☐	09 6566	Resilient Athletic Flooring
	☐	09 6603	Precast Terrazzo Flooring for Stairs
	☐	09 6613	Thick-Set Terrazzo Flooring
2019-08-23	☐	09 6623	Thin-Set Terrazzo Flooring
	☐	09 6723	Resinous Flooring
2019-08-23	☐	09 6800	Carpeting
	☐	09 6900	Access Flooring

2019-08-23	☐	09 7200	Wall Covering
	☐	09 7213	Tackboard Wall Coverings
	☐	09 7500	Interior Stone Facing
	☐	09 7723	Fabric Wrapped Panels
2019-08-23	☐	09 8433	Acoustical Wall Panels
2019-08-23	☐	09 9100	Painting
	☐	09 9413	Textured Interior Coatings
	☐	09 9600	High-Performance Coatings
	☐	09 9613	Multicolored Interior Coatings
2019-08-23	☐	09 9653	Elastomeric Coatings
2019-08-23	☐	09 9663	Textured Acrylic Coating

DIVISION 10 - SPECIALTIES

2019-08-23	☐	10 1100	Visual Display Boards
	☐	10 1146	Visual Display Fabrics
2019-08-23	☐	10 1400	Interior Signage
	☐	10 1443	Photoluminescent Exit Path Marking System
	☐	10 1700	Telephone Specialties
2019-08-23	☐	10 2113	Toilet Compartments
2019-08-23	☐	10 2115	Cubicle Specialties
	☐	10 2213	Wire Mesh Partitions
	☐	10 2223	Accordion Folding Partitions
2019-09-09	☒	10 2238	Operable Panel Partition
	☐	10 2239	Vertically Folding Panel Partitions
2019-08-23	☐	10 2613	Wall and Corner Guards
2019-08-23	☐	10 2813	Toilet Accessories
	☐	10 2819	Shower Doors and Enclosures
2019-08-23	☐	10 4116	Emergency Key Cabinets
2019-08-23	☐	10 4400	Fire Protection Specialties
	☐	10 4450	Automated External Defibrillators (AED)
2019-08-23	☐	10 5113	Metal Lockers
	☐	10 5116	Wood Lockers
	☐	10 5503	USPS-Delivery Postal Specialties
	☐	10 5506	Private-Delivery Postal Specialties
2019-08-23	☐	10 5713	Wall Mounted Coat Rack and Shelf
2019-08-23	☐	10 7310	Aluminum Walkways and Canopies
~~2019-09-06~~	☐	~~10 7500~~	~~Flagpoles~~ **Section deleted**

DIVISION 11 - EQUIPMENT

	☐	11 1300	Loading Dock Equipment
2019-08-23	☐	11 2400	Building Maintenance Equipment
2019-08-23	☐	11 5213	Projection Screens
2019-08-23	☐	11 7000	Medical Equipment
	☐	11 7313	Wall-Mounted Fold-Up Writing Surface
	☐	11 7316	Wall-Mounted Chart Rack

DIVISION 12 - FURNISHINGS

	☐	12 2113	Horizontal Louver Blinds
	☐	12 2116	Vertical Louver Blinds
2019-08-23	☐	12 2413	Roller Window Shades
	☐	12 2500	Between Glass Blinds
2019-09-09	☒	12 3553	Laboratory Casework
2019-09-09	☒	12 3571	Stainless Steel Casework
	☐	12 3640	Stone Countertops
2019-08-23	☐	12 3661	Simulated Stone Countertops
	☐	12 4816	Entrance Floor Grilles
	☐	12 4843	Entrance Floor Mats
	☐	12 6300	Stadium Seating
2019-08-23	☐	12 9313	Bicycle Racks

DIVISION 13 - SPECIAL CONSTRUCTION

	☐	13 2817	Ballpark Netting and Supports
	☐	13 3448	Pre-Fabricated Rooftop Helipad
	☐	13 4900	Radiation Protection
	☐	13 4923	RF/MRI Modular Shielding Enclosure
2019-05-10	☐	13 8500	Seismic Protection

DIVISION 14 - CONVEYING EQUIPMENT

	☐	14 1000	Dumbwaiters
2019-05-10	☐	14 2100	Electric Traction Elevators
	☐	14 2400	Hydraulic Elevators
	☐	14 3100	Escalators
	☐	14 9100	Chutes
	☐	14 9200	Pneumatic Tube Systems

DIVISION 31 - EARTHWORK

2019-01-18	☐	31 1000	Site Clearing
	☐	31 2000	Earth Moving
2019-02-08	☐	31 2200	Grading
2019-02-08	☐	31 2300	Excavation and Fill
2019-03-20	☐	31 2311	Earthwork for Building Construction
	☐	31 2400	Earthwork for Structures
2019-01-18	☐	31 2500	Erosion and Sedimentation Controls
	☐	31 3116	Termite Control
	☐	31 6213	Prestressed Concrete Piles
	☐	31 6216	Steel H Piles
	☐	31 6218	Mini-Piles
	☐	31 6329	Drilled Concrete Piers

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 33 - UTILITIES

END OF TABLE OF CONTENTS

SECTION 03 4500

ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Plant precast reinforced architectural concrete units and supplementary items necessary for installation.

1. Architectural precast concrete cladding units.

~~1.2 DELEGATED ENGINEERING REQUIREMENTS~~

~~A. Contract Documents Design Intent: Drawings and Specifications indicate design intent for products and systems and do not necessarily indicate or specify total Work required. Contract Documents shall not be construed as an engineered design; furnish and install all Work required for a complete installation.~~

~~B. Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems including attachment to building structure required to meet design intent of Contract Documents.~~

~~1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer.~~

~~C. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated for products and systems similar to this Project and has a record of successful in-service performance.~~

~~D. Coordination of Work:~~

~~1. Product Variations: In the event of minor differences between products and systems of acceptable or available manufacturers, Contractor shall notify Architect of such differences and resolve conflicts in a timely manner. Failure of Contractor to provide notification shall be construed as acceptance of conditions indicated, and changes caused by minor differences between products and Contract Documents shall be included in the Work at no additional cost to Owner.~~

~~2. Allowable Adjustments: Minor dimension and profile adjustments may be made in interest of fabrication or erection methods or techniques or ability to satisfy design intent, provided design intent is maintained as determined by Architect. Proposed deviations shall include a detailed analysis of impact to adjacent substrates or other building systems, including related design or construction cost impacts. If accepted by Architect, deviations causing changes in materials, constructability, substrates, or conditions shall be included in the Work at no additional cost to Owner.~~

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer/fabricator's technical literature for each product and system indicated.

1. Include manufacturer/fabricator's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Design Mixtures: Manufacturer/fabricator's detailed ingredients list for each concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work. Indicate details at building corners.

1. Indicate separate face and backup mixture locations and thicknesses.
2. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
3. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
4. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
5. Indicate relationship of units to adjacent materials.
6. Indicate joints, reveals, and extent and location of each surface finish.
7. Thin Masonry Facing Units: Indicate locations and details of thin masonry facing units, including corner units, special shapes, and joint treatments.
8. Stone Facing Units: Indicate locations and details of stone facing units, anchors, and joint treatments.
9. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Concrete-Faced Unit Samples for Verification Purposes: Exposed surfaces of concrete-faced units for each type of finish indicated, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 in by 12 in by 2 in (300 mm by 300 mm by 50 mm).

E. Thin Masonry Facing Unit Samples for Verification Purposes: Exposed surfaces of masonry-faced units for each type of finish indicated, in sets of 3, illustrating full range of color and texture variations expected; approximately 12 in by 12 in by 2 in (300 mm by 300 mm by 50 mm).

F. Stone Facing Unit Samples for Verification Purposes: Exposed surfaces of stone-faced units for each type of finish indicated, in sets of 3, illustrating full range of color and texture variations expected; approximately 12 in by 12 in by 2 in (300 mm by 300 mm by 50 mm).

1.4 INFORMATIONAL SUBMITTALS

A. Welding Certifications: Qualification certificates required by "Quality Assurance" Article. Include names of firms and personnel certified.

B. Material Certificates: For the following items, signed by manufacturers:

1. Cementitious materials.
2. Reinforcing materials.
3. Admixtures.
4. Bearing pads.
5. Structural-steel shapes and hollow structural sections.
6. Thin Masonry Facing Units: Brick units and accessories.
7. Stone Facing Units: Stone anchors.

C. Delegated Engineering Calculations: Informational submittal for products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation; test reports are not acceptable substitute for calculations.

D. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

1. Results that materials, including water, in concrete mix are free of ferrous or other material which will cause surface staining during curing operations or upon exposure to weather.
2. Results that aggregates have a stain index of less than 20 according to ASTM C 641.

E. Source Quality Control Test Reports: Reports from fabricator required by ‘‘Source Quality Control’’ Article.

F. Field Quality Control Reports: Written report of testing and inspection required by ‘‘Field Quality Control’’ Article.

G. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.
2. Submit verification that manufacturer/fabricator is a participant in one of the required certification programs as specified.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 10 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

1. Certification Program Participant: Participates in one of following:

a. PCI's plant certification program and designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.
b. APA's "Plant Certification Program for Production of Architectural Precast Concrete Products" and designated an APA-certified plant.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.
3. Manufacturer/Fabricator Acceptance: Installer shall be certified, approved, licensed, or acceptable to manufacturer/fabricator to install products.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

F. Welding: Qualify procedures and personnel according to AWS qualification requirements and following:

1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel".
2. AWS D1.4, "Structural Welding Code - Reinforcing Steel".

G. Pre-Production Sample Units: After sample acceptance and before fabricating architectural precast concrete units, produce sample units for review by Architect. Provide as many sample units as required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Use materials and installation methods indicated for the completed Work.

1. Produce a minimum of 2 field sample units approximately 16 sq ft (1.5 sq m) in area for review. Incorporate full-scale details of architectural features, finishes, textures, reveals. and transitions in sample units.
2. Locate field sample units at site in locations indicated or, if not indicated, as directed by Architect.
3. Damage part of an exposed-face surface for each finish, color, and texture and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
4. After acceptance of repair technique, maintain one field sample unit at fabricator's plant and one at site in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove field sample units when directed by Architect.

H. Range Sample Units: After pre-production sample unit acceptance and before fabricating units, produce a minimum of 3 sets of range samples, approximately 6 sq ft (1.5 sq m) in area, representing anticipated range of each color and texture on Project's units. After acceptance of range samples, retain one set of range samples at site and send remaining range sample sets to manufacturer/fabricator's plant for color and texture approval reference.

I. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

    a. Show typical components, attachments to building structure, and requirements of installation.

2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.6 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

a. Architect.
b. Contractor, including superintendent.
c. Installer, including project manager and supervisor.
d. If requested, Manufacturer's qualified technical representative.
e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
b. Review Contract Document requirements.
c. Review approved submittals.
d. Review inspection and testing requirements.
e. Review environmental conditions and procedures for coping with unfavorable conditions.
f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipping: Apply water repellent to units as specified in "Fabrication" Article in this Section before transporting them to the Project.

B. Delivery: Deliver units in such quantities and at such times to limit unloading units temporarily on ground. Support units during shipment on nonstaining shock-absorbing material.

C. Storage: Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping, or other physical damage.

D. Handling: Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage. Lift and support units only at designated points shown on Shop Drawings.

1.8 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

1.9 SEQUENCING

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer/fabricator. Provide secondary materials only as recommended by manufacturer/fabricator of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Engineer products and systems to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated and without permanent deformation or failure of materials.

B. Design Loads: Engineer to withstand design loads including but not limited to gravity, wind, seismic, and erection design loads and thermal movements established by authorities having jurisdiction, applicable local building codes and as indicated.

1. Structural Movement: Engineer to withstand movements of structure including, but not limited to, drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads. Contractor shall obtain required design data and identify movements accommodated on submittal drawings.

a. Accommodate plus or minus 3/8 in (10 mm) differential vertical deflection of floors.

C. Thermal Movements: Engineer products and systems to accommodate thermal movements of supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses, damaging loads on fasteners, failure of operating units to function properly, and other detrimental effects.

1. Temperature Change (Range): 120 deg F (49 deg C), ambient; 180 deg F (82 deg C), material surfaces.

D. Dimensional Tolerances: Engineer products and systems to accommodate dimensional tolerances of framing members and adjacent construction.

~~E. Fire-Resistance Rating: Where indicated, provide architectural precast concrete units whose fire resistance and minimum thicknesses to provide fire rating has been calculated and is acceptable to authorities having jurisdiction.~~

F. Building Maintenance Equipment: Engineer units supporting building maintenance equipment to resist pull-out and horizontal shear forces transmitted from equipment.

~~G. Vehicular Impact Loads: Engineer precast units acting as vehicular barriers for passenger cars to resist a single 6000 lb (26.7 kN) service load and 10,000 lb (44.5 kN) ultimate load applied horizontally in any direction to the unit, with anchorages or attachments capable of transferring this load to the structure. Engineer units assuming the load to act at a height of 18 in (450 mm) above the floor or ramp surface on an area not to exceed 1 sq ft (0.93 sq m).~~

H. ~~Hurricane Requirements: Engineer to withstand effects of cyclic wind pressures and windborne debris.~~

2.4 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes.

B. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent surface or joint treatments of concrete.

C. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer/fabricator's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface or joint treatments of concrete.

2.5 REINFORCING MATERIALS

A. Reinforcing Bars: One of both of the following as required:

1. Reinforcing Bars: ASTM A 615 / A 615M, Grade 60 (Grade 420), deformed.
2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706 / A 706M, deformed.

B. ~~Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), or ASTM A 706/ A 706M, deformed bars, ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized, and chromate wash treated after fabrication and bending.~~

C. Steel Bar Mats: ASTM A 184 / A 184M, fabricated from ASTM A 615 / A 615M, Grade 60 (Grade 420) or ASTM A 706 / A 706M, deformed bars, assembled with clips.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn or galvanized steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497 / A 497M, flat sheet.

F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.6 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray for non-exposed backup concrete, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray, white, tan, or a combination to produce exposed finish color selected, of same type, brand, and mill source.

B. Supplementary Cementitious Materials: Not to be used in face mixture; allowed in back of unit mixture only

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
3. Metakaolin Admixture: ASTM C 618, Class N.

4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining. Uniformly or gap graded to match approved sample.
2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, non-fading, and alkali resistant.

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer/fabricator to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer/fabricator to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.7 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36 / A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283 / A 283M.

D. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

E. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

F. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

G. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A / ASTM F 568M, Property Class 4.6; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 / A 563M; and flat, unhardened steel washers, ASTM F 844.

H. Zinc-Coated Finish: For steel items and connections exposed to exterior and unconditioned areas, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

I. Shop-Primed Finish: For steel items and connections exposed to interior and conditioned areas, prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 or SSPC-Paint 25 according to SSPC-PA 1.

J. Welding Electrodes: Comply with AWS standards.

K. Accessories: Cast-in structural steel anchors, inserts, plates, angles, clips, hangers, shims, bearing pads, and other similar accessories required to install units.

2.8 GROUT MATERIALS

A. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107 of consistency suitable for application within a 30-minute working time.

2.9 GUTTER DRAINAGE SYSTEM

A. Gutter drainage system at back of units may be either prefabricated silicone system or fabricated galvanized sheet steel system as indicated on the Drawings.

B. Prefabricated Silicone Gutter Drainage System: Flame-resistant extruded silicone collection channel system used to collect moisture or condensation on the back side of the units. Include accessories such as end dams, weep baffles and silicone weeps as necessary to drain collected moisture to the exterior of the building.

1. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include but are not limited to those listed below:

    a. Basis of Design: 2DS; "Secondary Drainage Systems - Precast".

C. Fabricated Galvanized Sheet Steel Gutter Drainage System: Galvanized sheet steel collection channel system used to collect moisture or condensation on the back side of the units. Include accessories such as end dams, weep baffles, and silicone weeps as necessary to drain collected moisture to the exterior of the building.

1. Zinc-Coated (Galvanized) Sheet Steel: ASTM A 653, G90 coating designation; structural quality, not less than 0.0312 in (0.79 mm) (20 gage) unless otherwise indicated.
2. Solder for Galvanized Sheet Steel: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.
3. Fabricate gutter drainage system to cross section indicated with clips and accessories required for secure watertight installation. Meet recommendations of SMACNA for fabrication details and metal thicknesses.

D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

E. Joint Sealant: Silicone construction sealant as specified in Division 07 Section "Joint Sealants".

2.10 CONCRETE MIXTURES

A. Mix Designs: Prepare design mixtures for each type of precast concrete required.

1. Limit use of fly ash and silica fume to 20 percent of Portland cement by weight; limit metakaolin and silica fume to 10 percent of Portland cement by weight. Not allowed in face of unit mix.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength: 5000 psi (34.5 MPa) minimum at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.11 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished Work.
2. Edges and corners shall be uniformly chamfered or radius as indicated on the Drawings.

2.12 FABRICATION

A. Fabrication Quality Standards: In addition to standards listed elsewhere, comply with following, unless otherwise specified in this Section:

1. PCI MNL 117.
2. Accepted submittals.
3. Contract Documents.

B. General: Fabricate units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with fabrication quality standard, product tolerances, and position tolerances for cast-in items.

C. Connection Hardware:

1. Fabricate cast-in anchors, inserts, plates, angles, and other anchorage hardware with sufficient anchorage and embedment to comply with delegated engineering.
2. Accurately position for attachment of loose hardware, and secure in place during precasting operations.
3. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
4. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

D. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete.

E. Cast-in openings larger than 10 in (250 mm) in any dimension. Do not drill or cut openings without Architect's approval.

F. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement:

1. Clean reinforcement of loose rust and mill scale and other materials that reduce or destroy bond with concrete.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 3/4 in (19 mm) minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Place reinforcing steel to maintain at least 3/4 in (19 mm) minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 in (38 mm) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by delegated engineering. Offset laps of adjoining widths to prevent continuous laps in either direction.

G. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

H. Placing Concrete:

1. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
2. Place face mixture to a minimum thickness after consolidation of greater of 1 in (25 mm) or 1.5 times maximum aggregate size, but not less than minimum reinforcing cover specified.
3. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in units.
4. Place backup concrete mixture to ensure bond with face-mixture concrete.

5. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

I. Hot and Cold Weather Concrete Placement: Comply with PCI MNL or ACI 306.1 procedures for cold weather concrete placement and ACI 305R recommendations for hot weather concrete placement.

J. Handling Units: Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

K. Curing: Cure concrete, according to PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

L. Defective Units: Discard and replace units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's and Owner's approval.

M. Preparation for Shipping: Prior to transporting units to the Project site, apply coating of water repellent to units as recommended by manufacturer/fabricator to protect unit surfaces from staining or moisture damage which may occur during transport. Water repellent shall not permanently change the appearance of the units from the approved field samples.

2.13 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Brick-Faced Architectural Precast Concrete Units: Restrict the following misalignments to 2 percent of number of bricks in a unit.

1. Alignment of Mortar Joints:

   a. Jog in Alignment: 1/8 in (3 mm).
   b. Alignment with Panel Centerline: Plus or minus 1/8 in (3 mm).

2. Variation in Width of Exposed Mortar Joints: Plus or minus 1/8 in (3 mm).
3. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 1/16 in (1.5 mm); minus 1/4 in (6 mm) less than or equal to depth of form liner joint.
4. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 1/4 in (6 mm); minus 1/8 in (3 mm).
5. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 1/16 in (1.5 mm); minus 1/4 in (6 mm) less than or equal to depth of form liner joint.

C. Stone Veneer-Faced (Smooth Finish) Architectural Precast Concrete Units.

1. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated: Plus or minus 1/4 in (6 mm).
2. Variation in Joint Width: 1/8 in in 36 in (3 mm in 900 mm) or a quarter of nominal joint width, whichever is less.

3. Variation in Plane between Adjacent Stone Units (Lipping): 1/16 in (1.5 mm) difference between planes of adjacent units.

2.14 CONCRETE-FACED UNIT FINISHES

A. Unit Finish: Unit faces shall be free of joint marks, grain, and other obvious defects. Corners, chamfers, and including false joints shall be uniform, straight, and sharp.

B. Exposed Face Surfaces: As scheduled or as indicated in Design Selections; match approved sample units for aesthetic purposes.

C. Exposed Top, Bottom, and Sides Surfaces: Match exposed face surface finish.

D. Exposed Back Surfaces: Smooth, steel-trowel finish.

E. Unexposed Surfaces: Float finish.

2.15 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect units according to PCI MNL 117 requirements.

B. Owner may employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 (ACI 318M) requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.

1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
2. Cores will be tested in an air-dry condition.
3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:

    a. Project identification name and number.
    b. Date when tests were performed.
    c. Name of precast concrete fabricator.
    d. Name of concrete testing agency.

e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Work: Units not complying with requirements, including strength, manufacturing tolerances, and finishes, are defective. Replace with units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

B. Acceptance of Building Structural Frame: Do not install units until supporting cast-in-place concrete building structural framing has attained minimum allowable design compressive strength, supporting structural steel framing, or other structure is complete.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. PCI MNL 127.
2. Respective manufacturer/fabricator's written installation instructions.
3. Accepted submittals.
4. Contract Documents.

3.3 PREPARATION

A. General: Comply with manufacturer/fabricator's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF ARCHITECTURAL PRECAST CONCRETE

A. Erection: Install units level, plumb, in alignment, and square within specified allowable tolerances.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
2. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of concrete.
3. Unless otherwise indicated, maintain uniform joint widths of 3/4 in (19 mm).

B. Attachments, General: Connect units in position by bolting, welding, or grouting.

C. Bolted Connections: Use lock washers, lock nuts, or other acceptable means to prevent loosening of bolted connections.

D. Welding: Perform welding in compliance with AWS D1.1/D1.1M and AWS D1.4 with qualified welders.

1. Protect units from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Repair damaged galvanized steel surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces.
3. Repair prime painted steel by cleaning and re-priming damaged painted surfaces.

E. Grouting Connections:

1. Grout connection block-outs after final adjustment.
2. Retain grout in place until hard enough to support itself.
3. Pack spaces with stiff grout material, tamping until voids are completely filled.
4. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
5. Keep grouted joints damp for not less than 24 hours after initial set.
6. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

3.5 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

B. Gutter Drainage System: Securely attach gutter drainage system to back of units using powder actuated fasteners as indicated on the Drawings. Seal joints with silicone joint sealant as specified in Division 07 Section "Joint Sealants". Slope system to positive drain to weeps.

3.6 FIELD QUALITY CONTROL

A. Testing Agency Field Service: The Owner may employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor’s expense.

B. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

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

D. Repair or remove and replace work where tests and inspections 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.

3.7 REPAIRS

A. Procedures:

1. Repair exposed surfaces of units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Architect and Owner. Architect and Owner reserves right to reject repaired units that do not comply with requirements.
2. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired Work, when viewed in typical daylight illumination from a distance of 20 ft (6 m).
3. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.
4. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
5. Remove and replace damaged units if repairs do not comply with requirements.

3.8 CLEANING

A. Cleaning: After erection and completion of joint treatment, clean exposed surfaces of units to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to manufacturer/fabricator's written recommendations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

3.9 FINISH SCHEDULE: Refer to Exterior Elevation drawings.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Flashing and sheet metal including assemblies listed below along with supplementary items necessary for installation:

1. Reglets with counterflashing.
2. Roof-drainage sheet metal fabrications.
3. Steep-slope roof sheet metal fabrications.
4. Embedded flashing.
5. Equipment support flashing.
6. Overhead-piping safety pans.

B. Related Requirements:

1. Refer to Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Refer to Division 7 Section for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

~~**1.2 DELEGATED ENGINEERING REQUIREMENTS FOR COPINGS AND GRAVEL GUARDS**~~

~~A. Contract Documents Design Intent: Drawings and Specifications indicate design intent for products and systems and do not necessarily indicate or specify total Work required. Contract Documents shall not be construed as an engineered design; furnish and install all Work required for a complete installation.~~

~~B. Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems including attachment to building structure required to meet design intent of Contract Documents.~~

~~1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer.~~

~~C. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated for products and systems similar to this Project and has a record of successful in-service performance.~~

~~D. Coordination of Work:~~

~~1. Product Variations: In the event of minor differences between products and systems of acceptable or available manufacturers, Contractor shall notify Architect of such differences and resolve conflicts in a timely manner. Failure of Contractor to provide notification shall be construed as acceptance of conditions indicated, and changes caused by minor differences between products and Contract Documents shall be~~

~~included in the Work at no additional cost to Owner.~~

~~2. Allowable Adjustments: Minor dimension and profile adjustments may be made in interest of fabrication or erection methods or techniques or ability to satisfy design intent, provided design intent is maintained as determined by Architect. Proposed deviations shall include a detailed analysis of impact to adjacent substrates or other building systems, including related design or construction cost impacts. If accepted by Architect, deviations causing changes in materials, constructability, substrates, or conditions shall be included in the Work at no additional cost to Owner.~~

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of special conditions.
9. Include details of connections to adjoining work.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification Purposes: Submit for items listed below; provide samples made from 12 in (300 mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1. Sheet Metal Flashing: 12 in (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 in (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Engineering Calculations: Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation; test reports are not acceptable substitute for calculations.

B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

C. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

D. Manufacturer's Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.

E. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

F. Warranty: Sample of warranty.

1. Provide manufacturer’s written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer/Fabricator Qualifications: Manufacturer/shop-fabricator with not less than 5 years experience with successful production of products and systems similar to scope of this Project, with a record of successful in-service performance and completion of projects for a period of not less than 5 years, and with sufficient production capability, facilities, and personnel to produce required Work.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be NRCA listed or shall provide other evidence acceptable to Architect as able to fabricate required details as tested and approved.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.

C. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1.7 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

    a. Architect.
    b. Contractor, including superintendent.
    c. Installer, including project manager and supervisor.
    d. If requested, Manufacturer's qualified technical representative.
    e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

    a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
    b. Review Contract Document requirements.
    c. Review approved submittals.
    d. Review inspection and testing requirements.
    e. Review environmental conditions and procedures for coping with unfavorable conditions.
    f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing materials and fabrications away from uncured concrete and masonry.

D. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit flashing and sheet metal work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

B. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

C. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Installer's Warranty: Furnish installer's written warranty signed by an authorized representative using installer's standard form agreeing to repair or replace components of all sheet metal flashing assemblies that exhibit defects in materials or workmanship within specified warranty period. "Defects" is defined to include, but not limited to, deterioration or failure to perform as required.

1. Warranty Period: 2 years from date of Substantial Completion.

B. Factory Applied Finish Warranty: Furnish manufacturer's written warranty signed by an authorized representative using manufacturer's standard form agreeing to repair finish or replace work which exhibits finish defects. "Defects" is defined to include but not limited to deterioration or failure of finish to perform as required.

1. Coverage includes but is not limited to the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Manufacturer shall warrant the installation to be free from finish defects for a period of 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

1. Manufacturers:

   a. Cheney Flashing Company.
   b. Fry Reglet Corporation.
   c. Hickman Company, W. P.
   d. Keystone Flashing Company, Inc.
   e. MM Systems Corporation.
   f. Petersen Aluminum Corporation.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Design Loads: Installed sheet metal flashing materials and fabrications shall withstand design loads including, but not limited to, requirements established by authorities having jurisdiction, applicable local building codes, and as indicated. Contractor shall obtain required design data and identify requirements accommodated on submittal drawings.

C. Material Compatibility: Provide flashing and sheet metal materials that are compatible with one another and specified roofing system under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.

D. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

E. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.4 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers'

written instructions.

2. Color: As scheduled or as indicated in Drawings.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304 , dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

D. Metallic-Coated Steel Sheet:

1. Zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation.
2. Aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A 755/A 755M.
3. Expoosed Finish:

a. Surface: Smooth, flat.
b. Exposed Coil-Coated Finish:

1) Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color and Gloss: As scheduled or as indicated in Drawings.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.5 UNDERLAYMENT MATERIALS

A. Material Compatibility: Provide underlayment materials that are compatible with substrates and specified roofing system under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.

B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.
3. SBS-Modified Asphalt Adhesive based Manufacturers and Products:

a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.

b. Grace Construction Products, a unit of W. R. Grace & Co.; Ice and Water Shield HT.
c. Henry Company; Blueskin PE200 HT.
d. Metal-Fab Manufacturing, LLC; MetShield.
e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

4. Butyl Adhesive based Manufacturers and Products:

a. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

5. Primer: Provided by underlayment manufacturer.
6. Underlayment Sealing Tape: Provided by underlayment manufacturer.

C. Slip Sheet: If recommended by manufacturer to separate sheet metal from underlayment; rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Manufacturer's recommended wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
4. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Rubberized-Asphalt Flexible Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 in (1.02 mm).

1. Manufacturers and Products:

a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
b. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
c. Grace Construction Products, W.R. Grace & Co.-Conn.; Perm-A-Barrier Wall Flashing.
d. Heckmann Building Products, Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
e. Hohmann & Barnard, Inc.; Textroflash.
f. W.R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
g. Polyguard Products, Inc.; Polyguard 400.

2. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

E. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 in (12 mm) wide and 1/8 in (3 mm) thick.

F. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

G. Sealant for Use at Concealed Joints: Contractor's option, one of the following:

1. Butyl: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
2. Silicone: ASTM C 920, single-component, neutral cure silicone sealant.

a. Basis of Design: Dow Corning; 758 Silicone Weather Barrier Sealant.

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, or cold-applied asphalt emulsion complying with ASTM D 1187; compounded for 15 mils (0.4 mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.7 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 in in 20 ft (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8 in (3 mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 ft (3 m) with no joints within 24 in (600 mm) of corner or intersection.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Soldered Seams: Fabricate nonmoving seams with flat-lock seams except at corners. Rivet joints where necessary for strength

1. Corners: Shop fabricate, factory mitered corners with continuously welded or soldered seams. Fabricate corners with no joints within 24 in (600 mm) of corner or intersection.

H. Copings 12" Wide or Less: Form butted joints with expansion space and 12 in (300 mm) wide, concealed backup plate with double sealant on each side of joint.

I. Copings Over 12" Wide: Form joints of intermeshing hooked flanges, not less than 1 in (25 mm) deep, filled with sealant concealed within joints.

J. Do not use graphite pencils to mark metal surfaces.

2.8 SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Fabricate from the Following Materials, minimum thickness as indicated unless required otherwise to meet performance requirements.
   a. Galvanized Steel: 0.028 in (0.7 mm) thick.

2. Corners: Factory mitered, mechanically clinched and sealed watertight.
3. Joints: Lapped, double seal with sealant.
4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
5. Accessories:

   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

6. Finish: With manufacturer's standard color coating, unless indicated otherwise.

2.9 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96 in (2400 mm) long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Gutter Profile: As indicated on Drawings, according to cited sheet metal standard.
2. Accessories: Wire-ball downspout strainer, Valley baffles.
3. Gutters with Girth up to 15 in (375 mm): Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.
   a. Aluminum: 0.032 in (0.8 mm) thick.
   b. Galvanized Steel: 0.028 in (0.7 mm) thick.
   c. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

4. Gutters with Girth 16 to 20 In (400 to 500 mm): Fabricate from the following materials:
   a. Aluminum: 0.040 in (1.0 mm) thick.
   b. Galvanized Steel: 0.028 in (0.7 mm) thick.
   c. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

5. Corners: Factory mitered, mechanically clinched and sealed watertight.
6. Joints: Lapped, double seal with sealant.

B. Downspouts: Fabricate rectangular, unless indicated otherwise, downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows. Size as recommended by SMACNA.

1. Hanger Style: As indicated, according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

   ~~a. Copper: 16 oz./sq. ft. (0.55 mm thick).~~
   b. Aluminum: 0.032 in (0.8 mm) thick.
   c. Galvanized Steel: 0.028 in (0.7 mm) thick.
   d. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

C. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
   1. Aluminum: 0.040 in (1.0 mm) thick.
   2. Corners and Joints: Factory mitered, solder or weld watertight.

2.10 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Expansion-Joint Covers, 2 In (50 mm) and Less: Fabricate cap type expansion cover with continuous flanges to hold cap and serve as counter flashing. Form section not to exceed 12 ft

(3.6 m) in length and joint cap sections by standing seams held in place by cleats. Shop fabricate interior and exterior corners. Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Aluminum: 0.050 in (1.25 mm) thick.
2. Galvanized Steel: 0.034 in (0.86 mm) thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.034 in (0.8 mm) thick.
4. Joint Style: Standing seam and seal with sealant.
5. Corners: Factory mitered and mechanically clinched and sealed watertight.
6. Joints: Standing seam, seal with sealant.

B. Manufactured Roof Expansion Joint Cover Systems, 2 in (50 mm) and Greater:

1. Refer to Division 07 Section "Expansion Control" for manufactured roof expansion joint covers.

C. Counterflashing: Manufactured units of heights to overlap top edges of base flashings by 4 in (100 mm) and in lengths not exceeding 12 ft (3.6 m) designed to snap into through-wall-flashing receiver and compress against base flashings with joints lapped. Shop fabricate interior and exterior corners. Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Aluminum: 0.032 in (0.8 mm) thick.
2. Galvanized Steel: 0.028 in (0.7 mm) thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.
4. Corners: Factory mitered and mechanically clinched and sealed watertight.
5. Joints: Lapped, double seal with sealant.

D. Flashing Receivers: Fabricate from same materials as counterflashing.

E. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 in (0.7 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

2.11 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Valley Flashing: Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Copper: 16 oz./sq. ft. (0.55 mm thick) .
2. Stainless Steel: 0.025 in (0.64 mm) thick.
3. Galvanized Steel: 0.028 in (0.7 mm) thick.
4. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.
5. Joints: Lapped, double seal with sealant.

B. Drip Edges: Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Copper: 16 oz./sq. ft. (0.55 mm thick) .
2. Stainless Steel: 0.025 in (0.64 mm) thick.
3. Galvanized Steel: 0.028 in (0.7 mm) thick.
4. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.
5. Joints: Lapped, double seal with sealant.

C. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Copper: 16 oz./sq. ft. (0.55 mm thick) .
2. Stainless Steel: 0.025 in (0.64 mm) thick.
3. Galvanized Steel: 0.028 in (0.7 mm) thick.
4. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

D. Counterflashing: Shop fabricate with factory mitered and continuously welded corners, seal watertight. Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.
1. Galvanized Steel: 0.028 in (0.7 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.
3. Joints: Lapped, double seal with sealant.

E. Flashing Receivers: Fabricate from same materials as counterflashing.

F. Roof-Penetration Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 in (0.7 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 in (0.7 mm) thick.

2.12 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Galvanized Steel: 0.028 in (0.7 mm) thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 in (0.64 mm) thick.
2. Galvanized Steel: 0.040 in (1.0 mm) thick.

C. Miscellaneous Flashings:

1. Fabricate to cross section indicated with clips and accessories required for secure watertight installation. Meet recommendations of SMACNA for fabrication details and metal thicknesses.
2. Not-Exposed to Public View: Fabricate from the following materials:
   a. Galvanized Steel: 0.028 in (0.7 mm) thick.

3. Concealed from View by other Construction: Fabricate from the following materials:

   a. Stainless Steel: 0.025 in (0.64 mm) thick.

2.13 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer's written installation instructions.
2. Accepted submittals.
3. Contract Documents.

B. Pitch Pockets (aka Pitch Pans) at Roof Penetrations: Pitch pockets (aka pitch pans) at roofing penetrations are not allowed and will be considered non-conforming work. Refer to the drawings for allowable roof penetration details.

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 in (150 mm) staggered 24 in (600 mm) between courses. Overlap side edges not less than 3-1/2 in (87 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. If recommended by manufacturer, apply slip sheet, wrinkle free, before installing sheet metal flashing and trim.

3.5 SHEET METAL FLASHING AND TRIM INSTALLATION

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

    a. Provide uniform, neat seams with minimum exposure of solder and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 in (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
3. Asphalt Roofing Cement: Bed flanges in thick coat of asphalt roofing cement where required by manufacturer of sheet metal flashing materials and fabrications for waterproof performance.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. When ambient temperature at time of installation is between 40 deg F and 70 deg F (4 deg C and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Concealed Sealant Joints: Use sealant-filled joints at lap joints unless otherwise

indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Exposed Sealant Joints: Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 in (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

H. Rivets: Rivet joints in uncoated metals where necessary for strength.

3.6 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous cleat..
3. Anchor gutter with gutter brackets or straps spaced not more than 30 in (750 mm)] apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 ft (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-in (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 in (25 mm) from walls. Locate hangers at top and bottom and at approximately 60 in (1500 mm) o.c.
2. Terminate downspouts as indicated on Drawings.

    a. Provide elbows at base of downspout to direct water away from building.
    b. Connect downspouts to underground drainage system.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.

E. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Exterior Wall: Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
2. Exterior Wall and Conductor Head: Loosely lock front edge of scupper with conductor head.
3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 in (25 mm) below scupper or gutter discharge.

G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 in (100 mm) in direction of water flow.

3.7 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate.
2. Anchor interior leg of coping as indicated on Drawings.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 in (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 in (100 mm) over base flashing. Lap counterflashing joints minimum of 4 in (100 mm). Secure in waterproof manner by means of anchor and washer at 36 in (910 mm) centers unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

3.8 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings. Secure in a waterproof manner by means of anchor and washer at 36 in (900 mm) centers.

B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 in (100 mm) over top edge of base flashings.

C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 in (100 mm) over top edge of base flashings. Lap counterflashing joints a minimum of 4 in (100 mm) and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.9 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.10 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 in in 20 ft (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8 in (3mm) offset of adjoining faces and of alignment of matching profiles.

3.11 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Touchup Painting: Clean abraded or damaged areas of shop paint finish and paint exposed areas with the same material used for shop painting. Touchup finish is to match undamaged finish and extend into retained adjoining finish in a manner that will minimize evidence of touchup.

F. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.12 FINISH SCHEDULE

A. Steel Sheet Finishes:
   1. Color and Gloss: Match color of adjacent building material, contingent upon approval by Architect.

B. Aluminum Sheet Finishes:
   1. Color and Gloss: Match color of adjacent building material, contingent upon approval by Architect.

END OF SECTION

SECTION 0 77200

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Roof accessories and supplementary items necessary for installation of the following:

1. Roof curbs.
2. Equipment supports.
3. ~~Roof hatches~~.
4. Heat and smoke vents.
5. Rooftop pipe supports.
6. Precast concrete splash blocks.
7. ~~Snow guards~~.
8. ~~Snow and ice melt systems~~.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work. Indicate dimensions, loadings, and special conditions.

C. Samples for Initial Selection: Submit for each exposed product with factory-applied color finishes in each color and texture specified, prepared on Samples of size to adequately show color.

D. Samples for Verification Purposes: Submit for each type of exposed finish required, prepared on Samples in manufacturer's standard sizes, and of same thickness and material indicated for the Work. If finishes involve normal color or shade variations, include sample sets showing the full range of variations expected.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality Control Reports for Snow and Ice Melt System: Written report of testing and inspection required by "Field Quality Control".

B. Snow and Ice Melt System Manufacturer's Project Acceptance Document: Certification by the manufacturer that its products and systems are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.

C. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

D. Warranty: Sample of warranty.

1. Provide manufacturer's written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 10 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Installer Qualifications for Snow and Ice Melt System:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.
3. Manufacturer Acceptance: Installer shall be certified, approved, licensed, or acceptable to manufacturer to install products.

1.6 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

a. Architect.
b. Contractor, including superintendent.
c. Installer, including project manager and supervisor.
d. If requested, Manufacturer's qualified technical representative.
e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
b. Review Contract Document requirements.
c. Review approved submittals.
d. Review inspection and testing requirements.
e. Review environmental conditions and procedures for coping with unfavorable conditions.
f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roof accessories to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, and date of manufacture.

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

C. Handle, store, and install roof accessories in a manner to avoid permanent deflection of roof deck.

1.8 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.9 WARRANTY

A. Manufacturer's Warranty for Roof Hatches and Smoke Vents: Furnish manufacturer's written material warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials required to repair or replace work which exhibits material defects caused by manufacture or design of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge to the Owner.

1. Warranty Period: Manufacturer shall warrant the products to be free from material defects for a period of 5 years from date of Substantial Completion.

B. Manufacturer's Warranty for Snow and Ice Melt System: Furnish manufacturer's written material warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials required to repair or replace work which exhibits material defects caused by manufacture or design of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Warranty Period: Manufacturer shall warrant the products to be free from material defects for a period of 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

C. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

2.4 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653 / A 653M, G90 (Z275) coating designation.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792 / A 792M, AZ50 (AZM150) coated.

C. Steel Tube: ASTM A 500, round tube.

D. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123 / A 123M.

E. Galvanized Steel Pipe: ASTM A 53/A 53M, hot-dip galvanized according to ASTM A 123 / A 123M.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Treated Wood Nailers: As specified in Division 06 Section "Miscellaneous Rough Carpentry".

C. Security Grilles: 3/4 in (19 mm) diameter, ASTM A 1011 / A 1011M steel bars spaced 6 in (150 mm) on center in one direction and 12 in (300 mm) on center in the other; factory finished as follows:

1. Surface Preparation: Remove mill scale and rust, if any, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling".
2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
3. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats under prolonged exposure.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mils (0.762 mm) thickness per coat.

E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153 / A 153M or ASTM F 2329.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

J. Underlayments:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6 mils (0.15 mm) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3 lb/100 sf (0.16 kg/sm) minimum, rosin sized.

2.6 ROOF CURBS

A. Insulated Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers:

a. Custom Solution Roof and Metal Products.
b. Pate Company.
c. Roof Products, Inc.

d. Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.079 in (2 mm) thick. Factory prime coating finish.

D. Construction:

1. Insulation: Manufacturer's standard.
2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
3. Factory-installed treated wood nailer at top of curb, continuous around curb perimeter.
4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
5. Fabricate curbs to minimum height of 12 in (300 mm) unless otherwise indicated.
6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
8. Security Grille: Provide where indicated.

2.7 EQUIPMENT SUPPORTS

A. Insulated Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers:

a. Custom Solution Roof and Metal Products.
b. Pate Company.
c. Roof Products, Inc.
d. Thybar Corporation.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Material: Zinc-coated (galvanized) or Aluminum-zinc alloy-coated steel sheet, 0.079 in (2 mm) thick. Factory prime coating finish.

D. Construction:

1. Insulation: Manufacturer's standard.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous treated wood nailers 3-1/2 in (87 mm) wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.

5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 in (300 mm) unless otherwise indicated.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.8 HEAT AND SMOKE VENTS

A. Heat and Smoke Vents: Manufacturer's standard, with double-walled insulated curbs, welded or mechanically fastened and sealed corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-walled lid and continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms and UL-listed fusible links rated at 165 deg F (74 deg C) and coordinated with fire-suppression and smoke-detection systems.

1. Manufacturers:

    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. Bilco Company.
    d. Dur-Red Products.
    e. J.L. Industries, Inc.
    f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
    g. Nystrom Building Products.

2. Type and Size: As indicated on the Drawings.
3. Loads: Minimum 40 lbf/sf (1.9 kPa) external live load and 30 lbf/sf (1.4 kPa) internal uplift load.

    a. When release is actuated, lid shall open against 10 lbf/sf (0.5 kPa) snow or wind load and lock in position.

4. Heat and Smoke Vent Standard: Provide units that have been tested and listed to comply with UL 793 and are FMG Approved.
5. Curb, Framing, and Lid Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.079 in (2.01 mm) thick.
6. Construction:

    a. Insulation: Manufacturer's standard.
    b. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
    c. Exterior Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
    d. Fabricate curbs to minimum height of 12 in (300 mm), unless otherwise indicated.
    e. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.
    f. Security Grille: Provide where indicated.

7. Hardware: Manufacturer's standard, corrosion resistant or hot-dip galvanized; with hinges, hold-open devices, and independent manual-release devices for inside and outside operation of lids.

2.9 ROOFTOP PIPE SUPPORTS

A. Rooftop Supports for Piping, Conduit, Cable Tray or Equipment: Installation without requiring roof penetrations, flashing, or damage to the roofing material. Support bases and pipe rollers made of an engineered thermoplastic with appropriate additives for UV protection. All structural steel components hot-dipped galvanized. Height-adjustable supports must be used where necessary. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. Support base to have radiused edge to enhance compatibility with roof membranes.

1. Load Capacity: Up to 1,500 lbs (680 kg).

B. The rooftop strut support shall provide a fixed-height mounting platform of 4 or 6 inches (100 or 150 mm) off of the roof and a usable strut length of up to 10 or 16 inches (250 or 400 mm).

C. The adjustable-height strut support shall allow elevations changes of up to 16 inches (400 mm) off of the roof and a usable strut length of up to 10 or 16 inches (250 or 400 mm).

D. The rooftop roller support shall provide roller capacity for up to nominal 6 inches (150 mm) steel pipe with a minimum 5-1/2 inches (138 mm) fixed height off of the roof.

E. The adjustable-height roller support shall provide roller capacity for up to nominal 6 inches (150 mm) steel pipe and accommodate elevation changes of up to 16 inches (400 mm) off of the roof. The rollers shall be polymeric. The roller axle, fittings and other hardware shall be manufactured of hot-dipped galvanized steel.

F. Basis of Design: ERICO International Corporation; ST Series, Strut-based Thermoplastic Supports.

2.10 PRECAST CONCRETE SPLASH BLOCKS

A. Prefabricated units of reinforced Portland cement concrete, aggregates, admixtures, and water; shaped to divert water away from building. Minimum size: 12 in (300 mm) by 24 in (600 mm) by 3 in (75 mm) high. Weight: 50 lbs (22.6 kg). Provide protection layer below splash block to protect roofing system.

~~2.11 SNOW GUARDS~~

~~A. Snow Guards, General: Prefabricated, noncorrosive units designed to be installed without penetrating roofing system; complete with predrilled holes, clamps, or hooks for anchoring. Snow guards materials and mounting method shall be fully compatible with adjacent roofing system to avoid any damage or penetrations which may compromise the integrity of the system.~~

~~B. Surface-Mounted, Plastic, Stop-Type Snow Guards: Clear polycarbonate stops designed for attachment to panel surface of roofing system using construction adhesive, silicone or polyurethane sealant, or adhesive tape.~~

C. ~~Surface-Mounted, Metal, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to panel surface of roofing system using construction adhesive, silicone or polyurethane sealant, or adhesive tape.~~

D. ~~Seam-Mounted, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to vertical ribs of standing-seam sheet metal roofing with stainless-steel set screws.~~

E. ~~Seam-Mounted, Bar-Type Snow Guards: Rail- or fence-type assembly consisting of mill-finished aluminum or stainless-steel rods, bars, or pipe held in place by stainless-steel clamps attached to vertical ribs of standing-seam sheet metal roofing.~~

F. ~~Surface-Mounted, Copper, Stop-Type Snow Guards: Bronze-alloy stops designed for attachment to panel surface of copper roofing using solder.~~

G. ~~Manufacturers:~~

1. ~~Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.~~
2. ~~Berger Building Products.~~
3. ~~Chemlink, Inc.~~
4. ~~LMCurbs~~
5. ~~Polar Blox.~~
6. ~~Precision Molding Co., Inc.~~
7. ~~Snoblox / Snojax Inc.~~
8. ~~Sno-Gem, Inc.~~
9. ~~TRA Mage Inc.~~
10. ~~Zaleski Snow-Guards & Roofing Specialties~~

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of accepted Samples and are assembled or installed to minimize contrast.

2.13 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2. Color: As scheduled or as indiciated in Design Selections.
3. Baked-Enamel:

C. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer's written installation instructions.
2. Accepted submittals.
3. Contract Documents.

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

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in **Work.**

3.4 INSTALLATION OF ROOF ACCESSORIES

A. General: Install and securely anchor roof accessories directly to structural supporting deck or substrate (not on top of wood blocking) so they are capable of resisting indicated loads.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
3. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous paint or by other permanent separation as recommended by manufacturer.

1. Underlayments: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level, unless otherwise indicated.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

~~E. Roof-Hatch Installation:~~

~~1. Install roof hatch so top surface of hatch curb is level, unless otherwise indicated.~~
~~2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.~~
~~3. Attach safety railing system to roof-hatch curb.~~
~~4. Attach ladder-assist post according to manufacturer's written instructions.~~

F. Heat and Smoke Vent Installation:

1. Install heat and smoke vent so top perimeter surfaces are level.
2. Install and test heat and smoke vents and their components for proper operation according to NFPA 204.

G. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

H. Rooftop Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Provide complete and adequate support of all piping and conduit, whether or not all required devices are shown.
2. The use of wood for supporting piping is NOT permitted.
3. Provide supports spaced so deflection of piping does not exceed 1/240 of span.
4. Isolation Pads: Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and support. Set isolation pads in adhesive if required by manufacturer's instructions. Place supports on isolation pads.

I. Precast Concrete Splash Blocks: Install splash block at outlet locations of downspouts. Set splash block over protection layer to protect roofing system.

~~J. Stop-Type Snow Guards: Attach snow guards to roofing system with adhesive or adhesive tape, as recommended by manufacturer. Do not use fasteners that will penetrate roofing system. Install snow guards in layout, spacing, and pattern indicated on the Drawings.~~

~~K. Bar-Type Snow Guards: Attach bar supports to vertical ribs of metal roofing system with clamps or set screws. Do not use fasteners that will penetrate roofing system. Install snow guards in layout, spacing, and pattern indicated on the Drawings.~~

L. Snow and Ice Melt Systems: Install in accordance with manufacturer's written installations at layout, spacing, pattern and locations indicated on the Drawings. Coordinate the complete

snow and ice melt system installation with the gutter, roofing, and flashing installations.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.

3.6 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

E. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal framing systems, interior gypsum board faced walls, partitions, and ceiling assemblies, and supplementary items necessary for installation.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms not defined in this Section or in other referenced quality standards.

B. Damage: Stored or installed gypsum board materials shall be classified as defective and nonconforming Work if they have been exposed to wetness or dampness at any time prior to Substantial Completion or if they exhibit evidence of active or dormant mold or mildew.

C. Concentrated Loads: Wall or partition mounted equipment, wall finishes, stone facings, lead lined doors and frames, or ornamentation exceeding 15 lbs/sf uniform load, 75 lb. point load, or 50 lb/ lf lineal load.

1.3 DELEGATED ENGINEERING REQUIREMENTS

A. Contract Documents Design Intent: Drawings and Specifications indicate design intent for products and systems and do not necessarily indicate or specify total Work required. Contract Documents shall not be construed as an engineered design; furnish and install all Work required for a complete installation.

B. Project Framing Analysis: Analyze each framing condition for design loads indicated in performance requirements.

1. Provide framing products in sizes and thicknesses required to meet or exceed the criteria based on project loads, spans and in-service conditions.
2. Material Quality Standard for Metal Framing Components: Provide components of sizes indicated but not less than that required to comply with ASTM C 754 for conditions indicated.

C. Gypsum Board Assemblies Supporting Concentrated Loads - Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems required to support concentrated loads including attachment to building structure required to meet design intent of Contract Documents including, but not limited to, the following.

1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer responsible for their preparation.

D. Gypsum Board Assemblies Withstanding Seismic Loads - Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems required to withstand seismic loads including attachment to building structure required to meet design intent of Contract Documents including, but not limited to, the following.

1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer responsible for their preparation.

E. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated for products and systems similar to this Project and has a record of successful in-service performance.

F. Coordination of Contract Documents and Work:

1. Product Variations: In the event of minor differences between products and systems of acceptable or available manufacturer/fabricators. Contractor shall notify Architect of such differences and resolve conflicts in a timely manner. Failure of Contractor to provide notification shall be construed as acceptance of conditions indicated, and changes caused by minor differences between products and Contract Documents shall be included in the Work at no additional cost to Owner.
2. Allowable Adjustments: Minor dimension and profile adjustments may be made in interest of fabrication or erection methods or techniques or ability to satisfy design intent, provided design intent is maintained as determined by Architect. Proposed deviations shall include a detailed analysis of impact to adjacent substrates or other building systems, including related design or construction cost impacts. If accepted by Architect, deviations causing changes in materials, constructability, substrates, or conditions shall be included in the Work at no additional cost to Owner.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Include scaled and dimensioned drawings showing locations of control joints. Distinguish between shop and field-assembled work.

1. Gypsum Board Location Schedule: Provide detailed schedule in format similar to "Gypsum Board Schedule" at end of this Section indicating gypsum board products to be installed and their respective locations.

C. Shop Drawings for Engineered Gypsum Board Assemblies - Concentrated Loads: Scaled and dimensioned drawings showing locations, fabrication, and installation of gypsum board assemblies required to support concentrated loads, including plans, elevations, sections, details of components, and attachments to building structure; include seal and signature of delegated engineering professional responsible for their preparation.

D. Shop Drawings for Engineered Gypsum Board Assemblies - Seismic Loads: Scaled and dimensioned drawings showing locations, fabrication, and installation of gypsum board assemblies required to withstand seismic loads, including plans, elevations, sections, details of components, and attachments to building structure; include seal and signature of delegated engineering professional responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Delegated Engineering Calculations: Informational submittal for products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation; test reports are not acceptable substitute for calculations.

B. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

C. Preconstruction Test Reports for Acoustical Sealant: Compatibility test reports from sealant manufacturer indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility with sealants; include sealant manufacturer's certification of test results for sealant compatibility and recommendations for primers and substrate preparation needed to obtain adhesion and prevent corrosion of substrate.

D. Field Quality Control Reports: Written report of testing and inspection required by "Field Quality Control".

E. Manufacturer’s Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required.

F. Qualification Data:

1. For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up to comply with the following requirements, using materials indicated for the completed Work:

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

a. Show typical components, attachments to building structure, and requirements of installation.
b. Field Samples for Gypsum Board Finishing: Build 10 ft (3 m) square gypsum board (attached to metal studs) area for each finish level specified. Include not less than one tapered-to-tapered edge gypsum board joint and cut edge-to-cut edge gypsum board joint.

2. Clean exposed faces of mock-up.
3. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Protect accepted mock-up from the elements with weather-resistant membrane.
6. Obtain Architect's acceptance of mockups before starting fabrication.
7. Maintain mock-ups during construction in an undisturbed condition as a standard for review of the completed Work.
8. Acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor, submitted to Architect in writing, and accepted by Architect in writing.
9. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

C. Fire Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested according to ASTM E 119/NFPA 251/UL 263 by one of following independent testing and inspecting agency as evidenced by design designation included in their associated approval manual:

1. UL - "Fire Resistance Directory", Category BXUV.
2. GA 600 - "Fire Resistance Design Manual".
3. Other agency acceptable to authorities having jurisdiction.

D. Smoke Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested according to indicated fire resistance rated assemblies by independent testing and inspecting agency acceptable to authorities having jurisdiction.

E. Sound (STC) Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested according to ASTM E 90 and classified according to ASTM E 413 by independent and testing agency acceptable to authorities having jurisdiction.

1.7 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Comply with ASTM C 840 requirements or respective gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

B. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Provide products and systems to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated and without permanent deformation or failure of materials.

B. Design Loads: Provide products and systems to withstand design loads including but not limited to gravity, wind, seismic, and erection design loads established by authorities having jurisdiction, applicable local building codes, and as indicated.

1. Structural Movement: Provide products and systems to withstand movements of structure including, but not limited to, drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads. Contractor shall obtain required design data and identify movements accommodated on submittal drawings.

    a. Accommodate plus or minus 3/8 in (10 mm) differential vertical deflection of floors.

C. Dimensional Tolerances: Provide products and systems to accommodate dimensional tolerances of framing members and adjacent construction.

2.4 SUSPENDED GRID SYSTEM FOR INTERIOR CEILINGS

A. Suspension System:

1. Material Quality Standard: ASTM C 645, heavy-duty rating.

2. Description: Manufacturer's standard direct-hung suspended grid system composed of main beams and cross furring .members that interlock to form a modular supporting network for application of gypsum board.
3. Protective Coating - Standard Applications: ASTM A 653/A 653M, not less than G40 (Z120), hot-dip galvanized coating, unless otherwise indicated.
4. Main Beams: Inverted T-shaped profile of single or double mounting flange; minimum 1-1/2 in (38 mm) profile height with top bulb and minimum 1-3/8 in (35 mm) wide knurled mounting flange; factory punched for hanger wire, and to receive cross furring members.
5. Cross Furring Members:

    a. Tees: Inverted T-shaped profile of single or double mounting flange; 1-1/2 in (38 mm) profile height with top bulb and minimum 1-3/8 in (35 mm) wide knurled mounting flange; with ends formed for positive interlocking with main beam.
    b. Channels: Inverted hat shaped profile; minimum 7/8 in (21 mm) profile height and minimum 1-3/8 in (35 mm) wide knurled mounting flange; with ends formed for positive interlocking with main beam.

6. Wall Angle: Angle shaped profile with each leg not less than 1-1/4 in (32 mm).
7. Curved Members: Where curved ceilings are indicated, members shall be rolled by manufacturer; field fabricated curved members not permitted.
8. Accessories: Specifically designed as an integral part of suspended grid system.
9. Manufacturers and Products:

    a. Armstrong World Industries Inc.; Drywall Grid System.
    b. Chicago Metallic Corporation; 650-C/670-C Fire-Rated Drywall Grid System.
    c. United States Gypsum Company (USG Interiors, Inc.); Drywall Suspension System.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

    a. Cast-in-place anchor, designed for attachment to concrete.
    b. Post-installed chemical anchor.
    c. Post-installed expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, ANSI A 10.3; low velocity, powder-actuated fasteners; drive pins and clip angles fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, an ultimate load capacity not less than 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
3. Manufacturers:

    a. Construction Materials, Inc.
    b. Heckman Building Products, Inc.
    c. Hilti Corp.
    d. ITW Ramset/Red Head.
    e. Powers Fasteners.
    f. Simpson Strong Tie Anchor Systems.

4. For post-tensioned concrete, anchors shall not exceed 1 in (25 mm) embedment. Obtain Structural Engineer's written approval for all proposed anchors in post-tensioned concrete prior to installation.

C. Wire:

1. Material Quality Standard: ASTM A 641 / A 641M, Class 1, zinc-coated, soft annealed, mild steel wire.
2. Tie Wire Minimum Size: Single 0.0625 in (16 gage) (1.6 mm) diameter strand, or double 0.0475 in (18 gage) (1.2 mm) diameter strands. Preformed furring channel clips are acceptable.
3. Hanger Wire Minimum Size: 0.1620 in (8 gage) (4.12 mm) diameter.

D. Rod Hangers: ASTM A 1008 / A 1008M, 7/32 in (0.56 mm) diameter mild carbon steel rod, with primer painted finish.

E. Flat Hangers: ASTM A 1008 / A 1008M, 1 in by 3/16 in (25 mm by 5 mm) by length indicated or required, with primer painted finish.

F. Angle Hangers: ASTM A 36 / A 36M, rolled steel angle, 2 in by 2 in (50 mm by 50 mm), with primer painted finish.

2.5 METAL FRAMING COMPONENTS

A. Project Framing Analysis: Analyze each framing condition for design loads indicated in performance requirements.

1. Provide framing products in sizes and thicknesses required to meet or exceed the criteria based on project loads, spans and in-service conditions.

B. Material Quality Standard: Provide components of sizes indicated but not less than that required to comply with ASTM C 754 for conditions indicated.

1. Sheet Steel: ASTM C 645 for metal.
2. Protective Coating - Standard Applications: ASTM A 653/A 653M, not less than G40 (Z120), hot-dip galvanized coating, unless otherwise indicated.
3. Protective Coating - High Moisture / Humidity Applications: ASTM A 653 / A 653M, G90 (Z275) hot-dip galvanized coating at high moisture areas such as Kitchens, Saunas, Steam Rooms, and Pool Enclosures.

C. Metal Studs and Floor Track (Runners):

1. Standard Metal Framing Components for Typical Partitions:

a. Stud Description: C-shaped members formed from galvanized sheet steel with 1 1/4 in (32 mm) flange edges bent back 90 degrees and doubled over to form 13/64 in (5 mm) wide minimum return lip; of web depth indicated on Drawings and uncoated base metal thickness indicated in “Metal Framing Schedule” at end of this Section; with web punchouts.

1) Alternative Jamb Stud Members - Contractor's Option: "Heavy Duty" or "King" studs; C-shaped members formed from galvanized sheet steel with 3 in (75 mm) flange width; of web depth indicated on Drawings and uncoated base metal thickness indicated in "Metal Framing Schedule" at end of this Section.

b. Track (Runner) Description: U-shaped members formed from galvanized sheet steel with depth compatible with studs and flange dimension indicated to hold studs by friction; of same web size and uncoated base metal thickness as studs.

1) Floor Track (Runner): 1-1/4in (32 mm).
2) Top of Wall Track (Runner): 3 in (75 mm).

2. Metal Framing for Shaftwall Partitions:

a. Stud Description: C-H, double E, C-T, or I-shaped members formed from galvanized sheet steel; of web depth indicated on Drawings and uncoated base metal thickness indicated in "Metal Framing Schedule" at end of this Section; with web punchouts.
b. Track (Runner) and Jamb Description: J-shaped track or jamb members formed from galvanized sheet steel with depth compatible with studs and flange dimension indicated to hold studs by friction; of same web size and uncoated base metal thickness as studs.

3. Optional Equivalent Products - Deformed Metal Studs and Tracks (Runners):

a. Evaluation Criteria: Product test reports and certifications from independent testing agency indicating products comply with requirements and are acceptable to authorities having jurisdiction.
b. Material Quality Standard: ASTM A 1003 / A 1003M sheet steel with galvanized coating.
c. Stud Description: C-shaped members formed from deformed surface galvanized sheet steel with 1-1/4 in (32 mm) flange edges bent back 90 degrees and bent again to form 3/16 in (5 mm) wide minimum return lip; of web depth indicated on Drawings and uncoated base metal thickness indicated in "Metal Framing Schedule" at end of this Section; with web punchouts.
d. Track (Runner) Description: U-shaped members formed from deformed surface galvanized sheet steel with depth compatible with studs and flange dimension indicated to hold studs by friction; of same web size and uncoated base metal thickness as studs.
e. Manufacturer and Product: ClarkDietrich Building Systems; ProSTUD.

D. Flat Straps and Back-Up Plates: Galvanized sheet steel for blocking and bracing in length and width indicated, of same uncoated base metal thickness as adjacent metal studs.

E. Bridging:

1. Channel: U-shaped members formed from galvanized sheet steel not less than 0.0566 in (16 gage) (1.44 mm) minimum uncoated base metal thickness, with 1/2 in (12 mm) flanges and depth fitting stud punchouts.
2. Clip Angle: 1-1/2 in by 1-1/2 in (38 mm by 38 mm) L-shaped members formed from galvanized sheet steel not less than 0.0713 in (14 gage) (1.81 mm) uncoated base metal thickness.

F. Rigid Furring Channels: Hat-shaped members formed from galvanized sheet steel not less than 0.0312 in (20 gage) (0.78 mm) minimum uncoated base metal thickness; 7/8 in (21 mm) depth and minimum 1-3/8 in (35 mm) wide knurled mounting flange.

G. Resilient Furring Channels: 1/2 in (12 mm) deep members formed from galvanized sheet steel not less than 0.0283 in (22 gage) (0.72 mm) minimum bare-metal thickness, designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Framing Accessories for Spanning Multiple Floors: Framing manufacturers standard connectors, bracings, brackets, clips, gussets, and other framing devices as required by conditions, formed from galvanized sheet steel complying with requirements of main support system.

I. Z-Shaped Furring: Members formed from galvanized sheet steel not less than 0.0283 in (22 gage) (0.72 mm) minimum bare-metal thickness, with slotted or non-slotted web, face flange of 1-1/4 in (32 mm), wall attachment flange of 7/8 in (21 mm); depth required to fit insulation thickness indicated.

J. Manufacturers:

1. Building Products Division of Consolidated Fabricators Corp.
2. California Expanded Metal Products Co. (CEMCO).
3. ClarkDietrich Building Systems
4. Marino Ware; Division of Ware Industries.
5. MBA Metal Framing.
6. Scafco Corp.

K. Heavy-Duty Framing Systems (HDS) Headers and Jambs at Lead Lined Doors: Manufacturer’’’s proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Heavy Duty Studs - HDS and Header Bracket —— HDSC and accessories as required for a complete installation.

   a. Minimum Base-Steel Thickness: 0.0538 inch (1.37 mm) or as indicated on drawings.
   b. Web and Flange Widths, Type HDS: 3-5/8 by 3 by 1-1/16 by 3/4 inch (92.1 by 76.2 by 27.0 by 19.1 mm) or 6 by 3 by 2-1/4 by 3/4 inch (152 by 76.2 by 57.2 by 19.1 mm); as indicated on drawings.
   c. Web and Flange Widths, Type HDSC: 3-1/2 by 3-1/16 by 2 inches (88.9 by 77.8 by 50.8 mm) or 5-7/8 by 3-1/16 by 2 inches (149 by 77.8 by 50.8 mm); as indicated on drawings.

2. Slip-Type Head Joints: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing for vertical movement.

   a. Basis of Design: ClarkDietrich Building Systems; Fast Top Clip FTC3 or FTC5.

3. Anchor Clips: Pre-punched, galvanized anchor clips designed for use in floor n conditions that provide a positive attachment of studs to runners while allowing for horizontal, torsional and vertical (uplift) loads.

    a. Basis of Design: ClarkDietrich Building Systems; EasyClip T-Series, T685 or T683.

2.6 PRE-ENGINEERED METAL FRAMING COMPONENTS

A. Deflection and Firestop Track (Runner):

1. Description: Proprietary track (runner) formed from galvanized sheet steel manufactured to accommodate movement of building structure without transferring stress to partition (to prevent cracking of gypsum board resulting from deflection of building structure above) while maintaining continuity of fire resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
2. Manufacturers:

    a. Metal Stud Framing Manufacturer.
    b. Fire Trak Corp.
    c. The Steel Network.

B. Flexible Track (Runner):

1. Description: Proprietary track (runner) formed from galvanized sheet steel manufactured to be flexible and adjustable to fit design requirements; in thickness not less than indicated for studs and in width to accommodate depth of studs.
2. Manufacturers:

    a. Metal Stud Framing Manufacturer.
    b. Accu-Arc Curved Wall Products.
    c. Flex-Ability Concepts.
    d. Radius Track Corp.

C. Headers:

1. Description: Proprietary header assembly formed from galvanized sheet steel manufactured to bear partition load above openings without transferring stress to partition (to prevent cracking of gypsum board); in thickness not less than indicated for studs and in width to accommodate depth of studs.
2. Manufacturers:

    a. Metal Stud Framing Manufacturer.
    b. Brady Construction Innovations, Inc.

2.7 GYPSUM BOARD PRODUCTS

A. Sizes: Maximum lengths and widths available that will minimize short edge-to-short edge butt joints and to correspond to support system indicated.

B. Typical Paper-Faced Gypsum Board Products:

1. Paper-Faced Type X Gypsum Board:

a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
b. Description: Noncombustible fire resistant gypsum core with paper surfacing on face, back, and long edges; tapered long edges; 5/8 in (15 mm) thick.
c. Manufacturers and Products:

1) American Gypsum Company; FireBloc Type X Gypsum Board.
2) CertainTeed Corporation; Type X Gypsum Board.
3) Georgia-Pacific Gypsum LLC; ToughRock Fireguard Gypsum Board.
4) National Gypsum Company; Gold Bond Fire-Shield Gypsum board.
5) United States Gypsum Company (USG); Sheetrock Firecode Core.

2. Sustainable Paper-Faced Type X Gypsum Board: At Contractor's option, provide sustainable paper-faced Type X gypsum board or typical paper-faced Type X gypsum board.

a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
b. Description: Noncombustible fire resistant gypsum core with paper surfacing on face, back, and long edges; tapered long edges; 5/8 in (15 mm) thick. UL Type Designation "ULIX".

1) ISO 14040 Environmental Management, Life Cycle Assessment, Principles and Framework:

a) Carbon emissions per Gypsum Association; Industry Standard Type III EPD for North American Type X wallboard with a manufacturing Global Warming Potential of 317.4 kg CO2-eq./1000MSF.
b) Water reduction per Gypsum Association; Industry Standard Type III EPD for North American Type X wallboard having net use of fresh water value of 1.329 m3/1000 ft2.
c) Primary Energy from non-renewable resources per Gypsum Association; Industry Standard Type III EPD for North American Type X wallboard have a value of 5,291 MJ/1000 ft2.

c. Basis of Design:

1) United States Gypsum Company, LLC, USG Sheetrock Brand EcoSmart Panels Firecode X.

3. Paper-Faced Type C Gypsum Board:

a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
b. Description: Noncombustible fire resistant gypsum core, with additives to enhance fire resistance, with paper surfacing on face, back, and long edges; tapered long edges; 5/8 in (15 mm) thick.
c. Manufacturers and Products:

1) American Gypsum Company; FireBloc Type C Gypsum Board.
2) CertainTeed Corporation; Type C Gypsum Board.
3) Georgia-Pacific Gypsum LLC; ToughRock Fireguard C Gypsum Board.
4) National Gypsum Company; Gold Bond Fire-Shield C Gypsum board.
5) United States Gypsum Company (USG); Sheetrock Firecode C Core Gypsum Panels.

4. Paper-Faced Flexible Gypsum Board at Curved Surfaces:

    a. Material Quality Standard: ASTM C 1396 / C 1396M.
    b. Description: Gypsum core with paper surfacing on face, back and long edges; manufactured to bend to fit tight radii and be more flexible than typical panels without wetting; tapered long edges; 1/4 in (6 mm) thick.
    c. Manufacturers and Products:

        1) American Gypsum Company; 1/4 ClasicRoc Gypsum Board.
        2) CertainTeed Corporation; 1/4”””” Flex Gypsum Board.
        3) Georgia-Pacific Gypsum LLC; ToughRock FlexRoc Gypsum Board.
        4) National Gypsum Company; Gold Bond High Flex Brand Gypsum board.
        5) United States Gypsum Company (USG); Sheetrock 1/4”””””””””””””” Flexible Gypsum Panels.

C. Moisture-Resistant Gypsum Board Products:

1. Moisture-Resistant Paper-Faced Gypsum Board:

    a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
    b. Description: Enhanced moisture-resistant, noncombustible gypsum core, with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 5/8 in (15 mm) thick.
    c. Manufacturers and Products:

        1) American Gypsum Company; M-Bloc Mold and Moisture Resistant Type X Gypsum Board.
        2) CertainTeed Corporation; M2Tech Moisture and Mold Resistant Type X Gypsum Board.
        3) National Gypsum Company; Gold Bond XP Gypsum Board.
        4) United States Gypsum Company (USG); Sheetrock Mold Tough Firecode Gypsum Board.

2. Moisture-Resistant Paperless Glass-Mat Gypsum Board:

    a. Material Quality Standard: ASTM C 1658 / C 1658M.
    b. Description: Enhanced moisture-resistant, noncombustible gypsum core with inorganic, embedded fiberglass mat on both faces; square edges; score or 10 according to ASTM D 3273; 5/8 in (15 mm) thick.
    c. Manufacturers and Products:

        1) Georgia-Pacific Gypsum LLC; DensArmor Plus Fireguard Interior Guard.
        2) National Gypsum Company; eXP Interior Extreme Gypsum Panels.

3. Moisture-Resistant Paper-Faced Shaft-Liner Gypsum Board:

    a. Material Quality Standard: ASTM C 1396/C 1396M, Type X.
    b. Description: Enhanced moisture-resistant, noncombustible gypsum core with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 1 in (25 mm) thick.
    c. Manufacturers and Products:

        1) American Gypsum Company; M-Bloc Shaft Liner Panels.

2) CertainTeed Corporation; M2Tech Moisture & Mold Resistant Shaftliner.
3) National Gypsum Company; Gold Bond 1" Fire-Shield Shaftliner XP.
4) USG Corp.; SHEETROCK Mold Tough Gypsum Liner Panels.

4. Moisture-Resistant Paperless Glass-Mat Shaft-Liner Gypsum Board:

a. Material Quality Standard: ASTM C 1396 / C 1396M.
b. Description: Enhanced moisture-resistant, noncombustible gypsum core with inorganic, embedded fiberglass mat on both faces, double bevel long edges; score of 10 according to ASTM D 3273; 1 in (25 mm) thick.
c. Manufacturers and Products:

1) American Gypsum Company; M-Glass Shaft Liner Panels.
2) CertainTeed Corporaton; GlasRoc Shaftliner Type X.
3) Georgia-Pacific Gypsum LLC; DensGlass Shaftliner.
4) National Gypsum Company; eXP Extended Exposure Shaftliner.
5) USG Corp.; SHEETROCK Glass-Mat Liner Panels

5. Moisture-Resistant Coated Glass-Mat Gypsum Board Products:

a. Material Quality Standard: ASTM C 1178 / C 1178M.
b. Description: Enhanced moisture-resistant, noncombustible, gypsum core with inorganic, embedded fiberglass mat on both sides; outside face coated with heat-cured copolymer water-resistant coating; square edges; score or 10 according to ASTM D 3273; 5/8 in (15 mm) thick.
c. Manufacturers and Products:

1) CertainTeed Corporation; Diamondback Tile Backer.
2) Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
3) National Gypsum Company; eXP Tile Backer.

6. Moisture-Resistant, Abuse-Resistant Gypsum Board Products:

a. Material Quality Standard: ASTM C 1629 (C 1629M), Type X, and as follows:

1) Soft Body Impact Test: ASTM E 695, Classification Level 2.
2) Hard Body Impact Test: Annex A1, Classification Level 1.
3) Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

b. Paper-Faced Products: Specially formulated, noncombustible, gypsum core with heavy liner paper on back and smooth, heavy abrasive-resistant face paper on face and long edges; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8 in (15 mm) thick.

1) Manufacturers and Products:

a) CertainTeed Corporation; Air Renew Extreme Abuse.
b) National Gypsum Company: Gold Bond Hi-Abuse XP Gypsum Board.

c. Paperless Products: Specially formulated, noncombustible, gypsum core with coated, fiberglass mat on both faces; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8 in (15 mm) thick.

1) Manufacturers and Products:

a) National Gypsum Company; Gold Bond eXP Interior Extreme AR Gypsum Panel.
b) USG Corporation; Fiberock Interior Panel, Abuse Resistant.

7. Moisture-Resistant, Impact-Resistant Gypsum Board Products:

a. Material Quality Standard: ASTM C 1629 (C 1629M), Type X, and as follows:

1) Soft Body Impact Test: ASTM E 695, Classification Level 3.
2) Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

b. Paper-Faced Products: Specially formulated, noncombustible, gypsum core with heavy liner paper on back and smooth, heavy abrasive-resistant face paper on face and long edges; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8 in (15 mm) thick.

1) Manufacturers and Products:

a) CertainTeed Corporation; Air Renew Extreme Impact.
b) National Gypsum Company: Gold Bond Hi-Impact XP Gypsum Board.

c. Paperless Products: Specially formulated, noncombustible, gypsum core with coated, fiberglass mat on both faces; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8 in (15 mm) thick.

1) Manufacturers and Products:

a) Georgia-Pacific Gypsum LLC; Dens Armor Plus Impact-Resistant Interior Panels.
b) National Gypsum Company; Gold Bond eXP Interior Extreme IR Gypsum Panel.
c) USG Corporation; Fiberock Panels, VHI Abuse-Resistant.

2.8 TRIM ACCESSORIES

A. Typical Drywall Trim Accessories:

1. Material Quality Standard: ASTM C 1047.
2. Description: Trim profile fabricated of galvanized steel sheet; of size suitable for gypsum board thickness; with recessed, perforated flange formed to receive joint compound.
3. Trim Products:

a. Cornerbead:

1) Purpose: For protecting outside (external) corners.
2) Basis of Design: United States Gypsum Company (USG); Dur-A-Bead Corner Bead, 103.

b. Optional Equivalent Products – Structural Laminate Cornerbead System: At Contractor's option, provide high strength tapered co-polymer core cornerbead with tight fibered paperboard facing and joint tape paper backing.

1) Purpose: For protecting outside (external) corners.
2) Basis of Design: Structus Building Technologies; No-Coat Structural Laminate Drywall Corner System.

c. LC-Bead (J-Bead):

1) Purpose: For protecting exposed edges of gypsum board where back flange can be used.
2) Basis of Design: United States Gypsum Company (USG); J-Trim, 200-A.

d. L-Bead:

1) Purpose: For protecting exposed edges of gypsum board where back flange cannot be used.
2) Basis of Design: United States Gypsum Company (USG); L-Trim, 200-B.

e. J-Stop:

1) Purpose: For protecting edges of gypsum board that does not require finishing.
2) Basis of Design: United States Gypsum Company (USG); J-Stop, 402.

f. Control Joint:

1) Description: One-piece trim formed with V-shaped slot, with removable strip covering slot opening.
2) Purpose: For conditions requiring expansion and contraction stresses of large areas of gypsum board to be relieved.
3) Basis of Design: United States Gypsum Company (USG); Control Joint, 093.

g. Other Trim or Special Shapes: Products as required by condition.

4. Manufacturers:

a. Dietrich Industries, Inc.; Unimast.
b. Fry Reglet Architectural Metals.
c. Marino Ware; Division of Ware Industries.
d. Niles Building Products Co.
e. Superior Metal Trim; Division of Delta Star, Inc.
f. United States Gypsum Company (USG).

B. Plastic Drywall Trim Accessories:

1. Description: Trim profile fabricated of high-impact PVC, of size suitable for gypsum board thickness; with recessed, perforated flange formed to receive joint compound.
2. Trim Products Profiles: As listed above in "Typical Drywall Trim Accessories".
3. Manufacturers:

    a. Alabama Metal Industries Corporation; a Gibraltar Industries Company.
    b. Phillips Manufacturing Co.
    c. Plastic Components, Inc.
    d. Trim Tex Drywall Products.
    e. Vinyl Corp., a division of ClarkDietrich Building Systems.

C. Accent Trim Accessories:

1. Description: Extruded aluminum accessories of profiles and dimensions indicated of alloy and temper with not less than strength and durability properties of ASTM B 221, alloy 6063-T5.
2. Basis of Design:

    a. Aluminum Trim Accessory Type:

        1) Manufacturer: Fry Reglet
        2) Product: F Reveal Molding
        3) Reveal Dimension: ¾-inch.
        4) Finish:

3. Manufacturers:

    a. Fry Reglet Architectural Metals.
    b. Gordon, Inc.
    c. Pittcon Industries.

D. Wall to Aluminum Window Trim Accessories (Perpendicular to Exterior Windows):

1. Sound Barrier Partition/Mullion Trim Cap:

    a. Description: Pre-assembled, spring loaded, extruded aluminum partition closures fabricated from 6063-T5 temper, tensile strength 31 KSI (ASTM B 221, ASTM B 221 M). STC rated with optional mineral wool batts for additional sound attenuation (approx. STC 57). Seal to mullion and wall or glass and wall with foam gasket, adhesive both sides.
    b. Manufacturers and Products:

        1) Basis of Design: "Mull-it-Over", 57 Wide Sound Barrier Mullion Trim Cap.
        2) STC: 57.
        3) Finish: As selected by Architect to match mullion finish.

2.9 FASTENERS

A. Limitations: Nails and staples are not permitted.

B. Fasteners for Attaching Metal Framing to Concrete Structure:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.

    a. Cast-in-place anchor, designed for attachment to concrete.
    b. Post-installed chemical anchor.
    c. Post-installed expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, ANSI A 10.3; low velocity, powder-actuated fasteners; drive pins and clip angles fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, an ultimate load capacity not less than 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
3. Manufacturers:

    a. Construction Materials, Inc.
    b. Heckman Building Products, Inc.
    c. Hilti Corp.
    d. ITW Ramset/Red Head.
    e. Powers Fasteners.
    f. Simpson Strong Tie Anchor Systems.

4. For post-tensioned concrete, anchors shall not exceed 1 in (25 mm) embedment. Obtain Structural Engineer's written approval for all proposed anchors in post-tensioned concrete prior to installation.

C. Metal Framing Screws: Screw fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten metal framing and furring members securely to substrates involved; complying with recommendations of gypsum board manufacturers for applications indicated.

D. Gypsum Board Screws:

1. Material Quality Standards:

    a. Metal Framing Members less than 0.03 in (0.75 mm) Thick: ASTM C 1002, Type S.
    b. Metal Framing Members from 0.033 in to 0.112 in (0.79 mm to 2.9 mm) Thick: ASTM C 954, Type S-12.

2. Product Description - Standard Applications: Bugle head, self-drilling, self-tapping, steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective gypsum board manufacturer; minimum 1 in (25 mm) long; with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
3. Product Description - High Moisture / Humidity Applications: Bugle head, self-drilling, self-tapping, stainless steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective gypsum board manufacturer; for use at high moisture areas such as Kitchens, Showers and Tub Enclosures, Saunas, Steam Rooms, and Pool Enclosures.

E. Miscellaneous Fasteners: For conditions not indicated, fasteners shall be type, finish, size, and holding power recommended by respective gypsum board manufacturer and conditions.

2.10 JOINT TREATMENT MATERIALS

A. Material Quality Standard: ASTM C 475 / C 475M.

B. Joint Tape:

1. Paper Tape: Nominal 2 in (50 mm) wide cross-fibered paper tape with finish suitable for bonding, creased in center for easy folding, and compatible with joint compound.
2. Mesh Tape: Nominal 2 in (50 mm) wide self-adhering 10-by-10 fiberglass mesh tape.

C. Joint Compound:

1. Setting-Type: Job-mixed powder for mixing with water, chemical-hardening compound; includes taping types.
2. Drying-Type: Ready-mixed or job-mixed powder for mixing with water, air-drying, vinyl based compounds; includes taping, topping, and all-purpose types.

2.11 INTERIOR SURFACING COMPOUNDS

A. Level 5 Primer and Surfacer: Latex based compound containing polyvinyl acetate (PVA) polymer that can be spray or roller applied to change a Level 4 finish to a Level 5 finish.

1. Manufacturers and Products:

a. CertainTeed Corporation; ProRoc Level V Wall and Ceiling Primer/Surfacer.
b. United States Gypsum Company (USG); Sheetrock Brand Tuff-Hide Primer-Surfacer.

B. Concrete Surfacing Compound: Vinyl-based, factory-formulated product applied in two or more coats as necessary for filling and smoothing to provide monolithic concrete surfaces to match Gypsum Board Level 4 finish.

1. Basis of Design: United States Gypsum Company (USG); Cover Coat Brand Compound.

2.12 RELATED MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced quality standards and recommendations of gypsum board manufacturer.

B. Firestopping Products at Penetrations: As specified in Division 07 Section "Penetration Firestopping".

C. Fiberglass Sound Attenuation Blankets:

1. Material Quality Standard: ASTM C 665, Type I.
2. Description: Unfaced blankets produced by bonding inorganic glass fibers with a thermosetting binder.
3. Description: Unfaced blankets produced by bonding inorganic glass fibers with a thermosetting binder; free of formaldehyde.
4. Surface Burning Characteristics: According to ASTM E 84/NFPA 255/UL 723:

a. Flame Spread: Class A - no greater than 25.
b. Smoke Developed: No greater than 50.

5. Thickness: Not less than 2-1/2 in (62 mm), unless otherwise indicated.
6. Manufacturers and Products:

a. CertainTeed Corporation; CertaPro AcoustaTherm Batts.
b. Johns Manville Building Insulation Div.; Sound Control Batts.
c. Knauf Fiber Glass; QuietTherm.
d. Owens Corning; Sound Attenuation Batts.

7. Basis of Design: Johns Manville; Sound Control Batts, Formaldehyde Free.

D. Mineral Wool Sound Attenuation Blankets:

1. Material Quality Standard: ASTM C 665, Type I.
2. Description: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of rock or slag with thermosetting resins.
3. Surface Burning Characteristics: According to ASTM E 84/NFPA 255/UL 723:

a. Flame Spread: Class A - no greater than 25.
b. Smoke Developed: No greater than 50.

4. Thickness: Not less than 3 in (75 mm), unless otherwise indicated.
5. Density: Not less than nominal 2.5 pounds per cubic foot.
6. Manufacturers:

a. Fibrex Insulations, Inc.
b. Rock Wool Manufacturing Co.
c. Roxul.
d. Thermafiber LLC.

E. Acoustical Sealant for Non-Fire Resistance Rated Joints:

1. Description: Manufacturer's standard nonsag, paintable, nonstaining sealant complying with ASTM C 834 or ASTM C 920. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90 or other acceptable test method.

a. Preconstruction Compatibility Testing: Test sealant for compatibility with copper substrates. Testing will not be required if data submitted on previous testing of current sealant products matches those submitted.
b. Do not use acrylic, neoprene, and nitrile based sealants that are not recommended for use with copper substrates.

F. Fire-Resistance Rated and Acoustical Putty Pads:

1. Product Quality Standard: UL 263 (ASTM E 119).
2. Description: Fire-rated, non-hardening, moldable, intumescent compound formed into sheets designed to seal penetrations, construction gaps, and around electrical boxes against spread of fire, smoke, and toxic gases.
3. Manufacturers and Products:

a. Grace Construction Products; Flamesafe FSP 1077 Putty Pads.
b. Hilti; CP 617 Intumescent Acoustic Putty Pads.
c. Hilti; CFS-P PA.
d. Specified Technologies, Inc; Series SSP Putty Pads.
e. Tremco; TREMstop Electrical Box Insert.
f. 3M; Fire Barrier Moldable Putty+Pads.

G. One-Piece Barrier Box:

1. Description: Rigid reinforced polyethylene box designed to fit around electrical boxes to prevent leaks of air and vapor.
2. Basis of Design: Lessco Air-Vapor Barrier Box.

H. Fire Resistive Sealants: Intumescent elastomeric sealant as specified in Division 07 Section "Fire-Resistive Joint Firestopping".

I. Sealants: Sealant as specified in Division 07 Section "Joint Sealants".

J. Isolation Strips: Adhesive-backed, closed cell neoprene or vinyl foam strips that allow fastener penetration with foam displacement, size as indicated, compressed 50 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective Manufacturer's written installation instructions.
2. Accepted submittals.
3. Contract Documents.
4. Gypsum Association GA 216.
5. United States Gypsum Company (USG); Gypsum Construction Handbook, if no other installation quality standard applies to condition.

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

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

B. Suspended Gypsum Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hanger wires at spacing required to support ceilings and that hangers will develop their full strength.

C. Coordination with Sprayed Fire-Resistance Materials:

1. Pre-Application Coordination: Before sprayed fire-resistance materials are applied, attach Z shaped clips and offset mounting plates to structural steel members with powder actuated fasteners, leaving portion of flange exposed outside of sprayed fire-resistive materials to attach head of wall track for gypsum board assembly.
2. Post-Application Coordination: After sprayed fire-resistive materials are applied, remove materials only to extent necessary for installation of gypsum board assemblies, attach Z shaped clips and offset mounting plates to structural steel members with powder actuated fasteners, leaving portion of flange exposed outside of sprayed fire-resistive materials to attach head of wall track for gypsum board assembly, and patch with fire-resistive material specified in Division 07 Section "Cementitious Fireproofing" that is required to obtain fire-resistance rating indicated.

3.4 INSTALLATION OF GYPSUM BOARD ASSEMBLIES

A. Comply with ASTM C 840.

B. Resistance Rated Partitions: Construct fire resistance rated, smoke resistance rated, and sound resistance rated partitions according to respective assembly test reports. Ensure every material used within an assembly shall comply with manufacturers listed and product qualities indicated in respective assembly test report.

C. Penetrations and Openings: Construct within gypsum board assemblies work as required to properly form penetration or opening to receive firestopping materials specified in following Sections:

1. Division 07 Section "Penetration Firestopping".
2. Division 07 Section "Fire-Resistive Joint Firestopping".

D. Control Joints: Install control joints at locations indicated on Drawings, in specific locations approved by Architect for visual effect and according to the following:

1. Spaced not more than 30 feet in either direction for uninterrupted straight planes of ceilings and walls.
2. Where different substrates occur at ceilings and walls.
3. Where control joints occur in substrates at ceilings and walls.
4. Where L, U, or T shaped ceiling configurations are joined.
5. At less-than-ceiling-height cased opening frames and gypsum board openings over 60 inches in width; extend control joints from both corners at top of frame or opening up to ceiling.
6. Where less-than-ceiling-height door frames occur on walls more than 30 feet in length; extend control joints from top of frame up to ceiling at corner of hinge side of door
7. Where less-than-ceiling-height borrowed lites occur on walls more than 30 feet in length; extend control joints from top of frame up to ceiling and from bottom of frame to floor at both corners.

E. Isolation from Building Structure: Isolate gypsum board assemblies from building structure to prevent transfer of loading imposed by structural movement.

1. Provide isolation joints as indicated or required by installation quality standards.
2. Isolate ceiling assemblies abutting or penetrated by building structure.
3. Isolate partition framing and wall furring abutting or penetrated by building structure, except at floor.

F. Building Expansion Joints: Avoid bridging building expansion joints with metal framing or furring members; frame both sides of joints independently with framing or furring members, coordinating with building expansion joint products specified in Division 07 Section "Expansion Control".

G. Fire-Resistance Rated and Acoustical Putty Pads: Hand apply pads to surfaces indicated, packing tightly into gaps and openings, in such a manner that pad will remain secured to surface; pinch pleat excess material together to close gaps.

H. One-Piece Barrier Box: Install in accordance with manufacturer's recommendations as indicated on the Drawings.

I. Supplemental Accessories: Install supplementary framing, blocking, reinforcing, and bracing in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, hand rails, furnishings, or similar construction. Comply with details indicated and recommendations of installation quality standards or manufacturer.

3.5 INSTALLING SUSPENDED GRID SYSTEM FOR INTERIOR CEILINGS

A. Installation Quality Standard: In addition to standards listed elsewhere, perform suspended ceiling work according to following, unless otherwise specified in this Section:

1. ASTM C 636 / C 636M.

B. Pattern: Lay out spaces and arrange suspension system in a regular pattern, parallel or perpendicular to surrounding walls.

C. Hangers for Ceiling System: Suspend hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with mechanical and electrical equipment, insulation or other objects within ceiling plenum that are not part of supporting structural frame or ceiling suspension system. Within limitations allowed by installation quality standards, splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers required to support suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by installation quality standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

4. Secure the appropriate hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Install metal framing components for suspended ceilings so that members are level to within 1/8 in in 12 ft (3 mm in 3.6 m) as measured both lengthwise on each member and transversely between parallel members.
6. Attach hangers to structural members.
7. Do not connect or suspend any ceiling components from ducts, pipes or conduit.

D. Perimeters: Using gypsum board screws through gypsum board into metal studs, attach perimeter wall angle where suspended grid system meets vertical surfaces unless otherwise indicated; cut main beams and cross furring members to fit into wall angle.

E. Main Beams:

1. Suspend main beams spaced 48 in (1200 mm) on center from structure with wire hangers spaced not greater than 48 in (1200 mm) on center.
2. Install main beams level within 1/8 in in 12 ft (3 mm in 3.6 m) with hanger wire taut and tightly wrapped to prevent vertical movement or rotation.
3. Do not make local kinks or bends in hanger wires as a means of leveling.

F. Cross Furring Members:

1. Install cross furring members at right angles to main beams, spaced as required and join to main beams with positive interlock.
2. Install cross furring members to within 1/32 in (0.8 mm) of their required location and within 0.015 in (0.38 mm) of same horizontal plane as main beam, and never below continuous member.
3. Install additional cross furring members at right angles to beams and cross furring members to support ends of recessed light fixtures, diffusers or grilles.

G. Seismic Conditions: Install bracing wires, compression struts, and other components as required by installation quality standard.

3.6 INSTALLING METAL FRAMING COMPONENTS

A. Priority: Assemble various assemblies giving priority to partitions with higher rating; extend partition with higher rating intact through partition with lower rating.

B. Joinery and Connections: Install various metal framing components according to details indicated; for situations and conditions not indicated, comply with installation quality standards and with respective manufacturer's recommendations.

C. General Requirements: Construct partition framing of studs, tracks, and headers using screws of number and spacing required.

1. Install studs of uncoated base metal thickness as determined by Metal Framing Schedule at end of this Section.
2. Extend partition framing full height to underside of structure above, except where partitions are indicated to terminate at, or immediately above, suspended ceilings.
3. Continue framing over door frames and openings to provide support for gypsum board.
4. Space studs as indicated on Metal Framing Schedule at end of this section.

5. Cut studs 1 in (25 mm) short of full height to provide deflection relief at head of wall conditions.
6. Install studs so that flanges point in same direction.
7. Attach with screws through each stud flange and track (runner) flange, except top deflection track assemblies.
8. For fire resistance rated, smoke resistance rated, and sound resistance rated assemblies that are required to extend to underside of structure above to obtain ratings, install framing around structural and other members extending below floor slabs or roof decks, as needed to support gypsum board closures and make partitions continuous from floor to underside of structure above.
9. Do not lap studs.
10. At intersections and corners, locate studs no more than 2 in (50 mm) from partition intersections and corners and secure with screws through both flanges of studs and tracks.

D. Metal Track (Runner) Requirements:

1. Floors: Install tracks (runners) using appropriate fasteners spaced not more than 16 in (400 mm) on centers.
2. Head of Wall: Install deep leg deflection tracks using appropriate fasteners to laterally support assembly, and to avoid axial loading of assembly by deflection from building structure above.
3. Head of Wall: Where indicated, install proprietary deflection and firestop track (runner) using appropriate fasteners for the substrate and installation conditions.

E. Support for Wall Mounted Accessories or Equipment: Install back-up plate or track (runner) turned on its side, using screws as indicated or as required, to studs to properly transfer accessory or equipment load to metal framing.

F. Openings: Frame single door, double door, above ceiling openings, and below ceiling openings using studs, tracks (runners), clip angles, and headers.

1. Install 2 studs on each side of each opening in configuration indicated, including strap plates; extend from floor to underside of structure above; do not cut these studs under any circumstances. Include sound attenuation blankets within cavity when partition is scheduled to have a sound resistance rating.
2. Construct header of appropriate configuration for type of opening to be spanned and secure with clip angles; include sound attenuation blankets within cavity when partition is scheduled to have a sound resistance rating.
3. Install short intermediate studs 16 in (400 mm) on center between top track and header.
4. At partitions indicated to terminate immediately above ceiling, install diagonal bracing at not less than spacing as indicated.

G. Supplementary Framing: Install around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by metal framing.

H. Penetrations: Maintain fire-resistance rating of assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

I. Chase Partitions:

1. Position double row of studs vertically in tracks (runners), opposite each other in pairs with flanges pointing in same direction.
2. Attach with screws through each stud flange and track (runner) flange.
3. Cross brace between rows of studs with one of following at 48 in (1200 mm) on center maximum vertically, attached to stud webs with screws:

    a. Coated glass-mat gypsum board, 12 in (300 mm) high by chase width.
    b. Metal studs turned on side, webs back-to-back.

J. Furred Walls:

1. Erect furring channels vertically, spaced 16 in (400 mm) on centers maximum, unless otherwise indicated.
2. Attach with appropriate fasteners, staggered on flanges.
3. Splice ends by nesting channels 8 in (200 mm) and securely anchoring to surface.
4. Miter 24 in (600 mm) long horizontal furring channels at corners and space 24 in (600 mm) on centers vertically.
5. Locate furring channels around perimeter of openings and secure to surfaces.

K. Control Joints:

1. Construct metal framing as indicated by installation quality standard to allow gypsum board control joints to function as intended.
2. For control joints located in fire resistance rated walls and partitions, construct of metal studs and mineral wool, full height of partition, according to assembly fire test reports.

L. Metal Framing Spanning Multiple Floors: Construct metal framing as required using longest length metal studs possible and attach to building structure with floor bypass clips.

M. Curved Partitions:

1. Metal Track (Runner) shall comply with one of following:

    a. Field Fabricated From Straight Components:

        1) Cut top and bottom runners (tracks) through leg and web at 2 in (50 mm) intervals for arc length. In cutting lengths of runners allow for uncut straight lengths of not less than 12 in (300 mm) at ends of arcs.
        2) Bend runners to uniform curve of radius indicated and locate straight lengths so they are tangent to arcs.
        3) Support outside (cut) leg of runners by clinching a 1 in (25 mm) high by runner thickness sheet metal strip to inside of cut legs using metal lock fasteners.

    b. Field crimped using a crimping tool.
    c. Manufactured flexible products.

2. For full height partitions, attach runners to structural elements at floor and ceiling with appropriate fasteners located 2 in (50 mm) from ends and spaced 12 in (300 mm) on centers.
3. For ceiling height partitions, attach runners to suspended ceilings with toggle bolts or hollow wall anchors located 2 in (50 mm) from ends and spaced 8 in (200 mm) on centers in between where attached to suspended ceilings.

4. Position studs vertically with open sides facing in same direction and engaging floor and ceiling runners.
5. Begin and end each arc with a stud and space intermediate studs equally along arcs at stud spacing recommended by gypsum board manufacturer for radii indicated.
6. Attach studs to runners with 3/8 in (10 mm) long pan head framing screws. On straight lengths at ends of arcs, place studs 6 in (150 mm) on centers with last stud left free standing.

N. Installation Tolerances: Install each metal stud metal framing and furring member so that fastening surfaces do not vary more than 1/8 in (3 mm) from plane formed by faces of framing members.

3.7 INSTALLING GYPSUM BOARD PRODUCTS

A. General Requirements:

1. Install type of gypsum board at location indicated by gypsum board schedule at end of this Section.
2. Do not install damaged gypsum boards.
3. Install gypsum boards with finishable face side out.
4. Butt gypsum boards together for a light contact at edges and ends with not more than 1/16 in (1.5 mm) of open space between panels.
5. Do not force gypsum boards into place.
6. Do not place tapered edges against cut edges or ends.
7. Locate panel joints so that no joint will align with the edge of an opening unless control joints are installed at these locations.

B. Isolation from Building Structure:

1. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments or surfaces where movement is anticipated. Provide 1/4 in to 1/2 in (6 mm in 12 mm) wide spaces at these locations or as indicated below:

    a. At top of wall or where partitions intersect open building structure members projecting below underside of floor slabs and roof decks, cut to fit profile formed by coffers, joists, beams, and other structural members; form proper annular joint to receive firestopping at rated partitions and form 3/4 in (20 mm) joint at top of wall at non-rated partitions.

2. Trim edges with edge trim where edges of gypsum boards are exposed.
3. Seal joints between edges and abutting structural surfaces with firestopping at rated locations and acoustical sealant at non-rated locations.

C. Single-Layer Board Assemblies:

1. At typical conditions, install gypsum board vertically (long dimension parallel to metal framing), to minimize short end-to-short end joints unless otherwise indicated or required by assembly fire test reports.
2. At interior of stairwells and other high walls, install gypsum boards horizontally, unless otherwise indicated or required by assembly fire test reports. Stagger abutting end joints not less than one framing member in alternate courses of gypsum boards.

D. Multi-Layer Board Assemblies: Apply base layers and face layers vertically (long dimension parallel to metal framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud space from base layer joints, unless otherwise indicated or required by assembly fire test reports. Stagger joints on opposite sides of partitions.

E. Ceiling Applications:

1. Apply gypsum board at right angles to main beams of suspension framing to minimize number of abutting end joints and avoid abutting end joints in central area of each ceiling.
2. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Locate both edge or end joints of gypsum boards over intermediate supports or gypsum board back-blocking where metal framing is not present.

F. Typical Wall Applications:

1. Attach gypsum boards to metal studs so that leading edge or end of each board is attached to open (unsupported) edges of stud flanges first.
2. Stagger vertical joints on opposite sides of partitions.
3. Do not make joints other than control joints at corners of framed openings.
4. Attach gypsum boards to framing provided at doors, openings and cutouts. Install gypsum boards over door heads and extend to not less than one stud space - 16 in (400 mm) at each side of door or opening.
5. Cover both faces of metal framing with gypsum boards as indicated, except in chase walls that are braced internally.
6. Cut and fit gypsum boards around ducts, pipes, conduits, and other penetrations to form proper annular joint to receive firestopping at rated partitions.

    a. At non-rated partitions, annual space around ducts, pipes, conduit or other penetrations to be properly sized to receive sealant; 3/4 in (20 mm) maximum.
    b. “Blow–out” patches are not allowed.

7. Support both edge and end joints of gypsum boards over metal framing.

G. Curved Wall Assemblies:

1. Install 2 layers of flexible gypsum board horizontally and unbroken, to extent possible, across curved surface plus 12 in (300 mm) long straight sections at ends of curves and tangent to them.
2. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum boards to studs as they are wrapped around curve. On concave side, start fastening gypsum boards to stud at center of curve and work outward to panel ends.
3. Fasten base layer to studs with screws spaced 16 in (400 mm) on centers maximum. Center second layer over joints in base layer, and fasten to studs with screws spaced 12 in (300 mm) on centers maximum.

H. Screw Attachments:

1. Attach gypsum board to metal framing with screw fasteners of type appropriate for gypsum board materials and installation conditions:

    a. Length shall be as required by condition and penetrating metal framing not less than 3/8 in (10 mm).

b. Spacing shall be as recommended by installation quality standard, gypsum board manufacturer, or respective assembly test report.
c. Use properly adjusted, positive-clutch electric power tool equipped with adjustable screw-depth head and a Phillips bit. Nails and staples are not permitted.

2. Drive screws to slightly dimple surface without breaking face paper, fracturing core, or stripping metal framing member around screw shank.
3. Space screws for non-fire resistance rated partitions and ceilings as recommended by installation quality standards.
4. Space screws for fire resistance rated partitions as required by assembly fire test reports.
5. Start field screwing near center and work towards edges.
6. Space screws not less than 3/8 in (10 mm) from gypsum boards edges.
7. Do not attach gypsum boards to top runner where wall or partition extends to building structure unless required by fire test reports.

I. Control Joints: Form control joints and expansion joints at locations indicated with required space between edges of adjoining gypsum boards.

J. Sound Attenuation Blankets: Install blankets within stud cavities set so that they are held in place by friction with metal studs; ensure blankets are secure within cavity and will not become displaced when second gypsum board side is closed.

K. Elevator Shaft Cants: Where gypsum board shaftwall assemblies cannot be positioned within 4 in (100 mm) of shaft face of structural beams, floor edges, and similar projections into shaft, install 5/8 in (15 mm) thick gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 in (600 mm) on centers with screws fastened to shaftwall framing.
2. Where steel framing is required to support gypsum board cants, install framing at 24 in (600 mm) on centers and extend studs from projection to shaftwall framing.

L. Sealant:

1. Comply with ASTM C 919 and manufacturers written recommendations for closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
2. Seal wall assemblies at perimeters, behind control joints, and at openings and penetrations with a continuous bead of sealant material according to following:

a. Fire Resistance Sealant: Joints within fire resistance rated assemblies.
b. Water Resistance Sealant: Joints within non-fire resistance rated assemblies exposed to possible water infiltration.
c. Acoustical Sealant: All other joints.

3.8 INSTALLING TRIM ACCESSORIES

A. General: Fasten trim accessories continuously according to accessory manufacturer's instructions using gypsum board screws; installation by clinch-on tool and staples not permitted.

B. Interior Trim Accessories: Install in the following locations:

1. Corner Beads: Install trim at external corners; use screws at each flange at 9 in (225 mm) on centers, opposite each other.
2. Edge Trim: Install trim where gypsum boards abut dissimilar material, and where edge of gypsum boards would otherwise be exposed; use screws at flange at 9 in (225 mm) on centers.

    a. LC-Bead (J-Bead): Install trim at exposed conditions where back flange can be attached to framing or supporting substrate before gypsum board installation.
    b. L-Bead: Install trim at exposed conditions where trim can only be installed after gypsum board installation.
    c. J-Stop: Install trim at concealed conditions where trim can only be installed after gypsum board installation.

3. Control Joints: Install trim at appropriate locations, ensuring gypsum board is not continuous over joint; use screws at each flange at 6 in (150 mm) on centers.

    a. Control joints to extend 4 in (100 mm) above finished ceiling at non-rated conditions and extend to structure at rated wall conditions.

C. Accent Trim Accessories: Install at locations indicated, mitering corners and intersections to form tight, flush and uniform joints; use screws at each flange at 9 in (225 mm) on centers.

D. Trim Accessories at Exterior Windows: Install at locations indicated, mitering corners and intersections to form tight, flush and uniform joints; use screws at each flange at 9 in (225 mm) on centers or as recommended by manufacturer for manufactured products.

3.9 FINISHING GYPSUM BOARD PRODUCTS

A. General: Treat board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare surfaces for decoration.

B. Joint Tape: Finish joints according to following:

1. Typical Paper-Faced Gypsum Board: Paper.
2. Moisture-Resistant Paper-Faced Gypsum Board: Mesh tape.

C. Finishing: Finish boards and units to achieve specified level of finish as indicated in schedule at end of Section:

1. Typical Paper-Faced Gypsum Board: Either or combination of the following as recommended by manufacturer:

    a. Setting-type joint compounds.
    b. Drying-type joint compounds.

2. Moisture-Resistant Paper-Faced Gypsum Board: Setting-type joint compounds.
3. Cementitious Backer Unit: Setting-type joint compounds.

3.10 INTERIOR SURFACING COMPOUNDS

A. Skim Coat Finishing with Joint Compound:

1. Prepare concrete surfaces for applied finishes.

a. Grind ridges, fins, and high areas.
b. Remove form oil, efflorescence and greasy deposits.
c. Fill offsets, voids, bugholes, rock pockets level with surrounding surfaces with joint compound.
d. Apply as many coats of joint compound as necessary to eliminate cracks.
e. Verify that resulting concrete surface is uniformly smooth and free of irregularities.

2. Apply setting-type joint compound or Level 5 Primer and Surfacer over entire surface in thickness recommended by manufacturer.

B. Skim Coat Finishing with Concrete Surfacing Compound:

1. Prepare concrete surfaces for applied finishes.

a. Grind ridges, fins, and high areas.
b. Remove form oil, efflorescence and greasy deposits.
c. Fill offsets, voids, bugholes, rock pockets level with surrounding surfaces with concrete surfacing compound.
d. Apply as many coats of concrete surfacing compound as necessary to eliminate cracks.
e. Verify that resulting concrete surface is uniformly smooth and free of irregularities.

2. Apply Concrete Surfacing Compound over entire surface in thickness recommended by manufacturer.

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics

3.12 ADJUSTMENTS

A. Damaged Materials: Stored or installed gypsum board materials shall be classified as damaged, defective, and nonconforming Work if they have been exposed to wetness or dampness at any time prior to Substantial Completion or if they exhibit evidence of active or dormant mold or mildew. Damaged materials and assemblies shall be replaced with new and dry materials and assemblies.

3.13 PROTECTION

A. Procedures: Protect products and systems from damage during installation and remainder of construction period according to manufacturer's instructions.

3.14 METAL FRAMING SCHEDULE

A. Metal Stud Framing Schedule:

1. Stud Depth: As indicated on Drawings.
2. Spacing: Maximum 16 in (400 mm) on centers, unless otherwise indicated, or as required to comply with respective assembly test report.
3. Minimum Performance Requirements - unless otherwise indicated:

    a. Typical Partitions: L/240 at 5 lb/sq ft (239 Pa) lateral load.
    b. Elevator Shaft Partitions: L/240 at 7.5 lb/sq ft (359 Pa) lateral load.
    c. Partitions with Tile Facing: L/360 at 7.5 lb/sq ft (359 Pa) lateral load.
    d. Partitions with Interior Stone Facing Concentrated Loads: Provide delegated engineering to comply with L/720 at 10 lb/sq ft (479 Pa) lateral load.
    e. Partitions supporting Lead Lined Doors and Frames: Provide delegated engineering to comply with L/480 at 10 lb/sq ft (479 Pa) lateral load.
    f. Partitions supporting all other Concentrated Loads: Provide delegated engineering to comply with L/360 at 10 lb/sq ft (479 Pa) lateral load

4. Minimum Uncoated Base Metal Thickness:

    a. Typical Gypsum Board Assemblies: As determined by manufacturer's limiting height engineering data unless otherwise indicated.

        1) 25 Gage or 25 Gage Equivalent Studs: Not acceptable.
        2) 25 Gage or 25 Gage Equivalent Studs: Typical at partitions without wall-mounted components installed on either side.
        3) 22 Gage Studs: Typical partitions unless otherwise indicated.
        4) 20 Gage or 20 Gage Equivalent Studs:

            a) Partitions supporting ceramic or stone tile.
            b) Partitions with gypsum board on one side only.
            c) At door jambs.
            d) Partitions supporting wall hung cabinets or shelving.
            e) Partitions with lead lining.

        5) 20 Gage Studs: Partitions enclosing high-rise elevator shafts and stairwells.

            a) 20 Gage Equivalent Studs: Allowed only if part of a tested assembly.

        6) 16 Gage Studs: Typical at partitions supporting stone facing unless otherwise indicated.

    b. Gypsum Board Assemblies required to Support Concentrated Loads: As required by delegated engineering professional but not less than minimum uncoated base metal thickness indicated above.
    c. Gypsum Board Assemblies required to Withstand Seismic Loads: As required by delegated engineering professional but not less than minimum uncoated base metal thickness indicated above.

3.15 GYPSUM BOARD SCHEDULE

A. Moisture-Resistant Gypsum Board: Install Moisture-Resistive Gypsum Board at all applications.

~~B. Gypsum Board Schedule, General: Install the designated gypsum board product based on exposure classification to water and / or moisture and applied finish system as follows, unless otherwise indicated or scheduled on the Drawings.~~

C. No Exposure: Surfaces not normally exposed to water and / or moisture sources including but not limited to the following:

1. Typical walls and ceilings.

a. Paint and Wall Coverings Only: Typical paper-faced gypsum board.
b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.

2. Horizontal fire-rated assemblies and ceilings:

a. Paint Only: Paper-faced Type C gypsum board.

3. Walls in acoustical barriers as indicated in the Drawings.

a. Paint and Wall Coverings Only: Paper-faced acoustically enhanced gypsum board.

4. Curved walls:

a. Paint and Wall Coverings Only: Paper-faced flexible gypsum board; installed in two layers.

5. Shaft-Side Face of Shaft-Liner Assemblies:

a. No Finish Required: Moisture-resistant paperless glass mat shaft-liner gypsum board.
b. No Finish Required: Moisture-resistant paper-faced shaft-liner gypsum board.

D. Incidental Exposure: Surfaces immediately adjacent to water and / or moisture sources including, but not limited to, the following locations:

1. Walls and ceilings in mechanical equipment rooms and janitor closets.
2. Walls within 24 inches of centerline of drinking fountains, isolated wall-hung lavatories, and countertop sinks and other similar water sources.
3. Interior face of exterior walls.
4. Acceptable gypsum board products for the above listed conditions:

a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.
b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.

5. Top of walls above ceilings adjacent to mechanical equipment in corridors.

a. Moisture-resistant paperless glass-mat gypsum board.

E. Direct Exposure: Surfaces normally soaked, saturated, or regularly and frequently exposed to water and / or moisture including, but not limited to, the following locations:

1. Walls and ceilings in toilet rooms and bathrooms including bathtubs and showers:

a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.

~~b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.~~

~~2. Walls and ceilings in saunas, steam rooms, gang showers, and pool enclosures:~~

~~a. Tile Only: Cementitious backer units.~~

3.16 GYPSUM BOARD FINISHING SCHEDULE

A. Gypsum Board Finishing Schedule, General: Finish panels to Levels of Finish indicated below. Apply joint tape over panel joints, except those with trim having flanges not intended for tape. Sand between coats and after last coat to produce a surface free of defects and ready for applied finish system.

1. Levels of Finish: According to ASTM C 840.

B. Preparation: Apply joint compound at open joints, panel edges, and damaged surface areas.

C. Level 1: At following locations, embed tape at joints in joint compound unless a higher level of finish is required for fire resistance rated assemblies. Trim accessories to be installed but not embedded in joint compound unless required for fire rating:

1. Ceiling plenum areas above ceilings.
2. Concealed areas.
3. Substrate for interior stone facing.
4. Substrate for interior woodwork.
5. Unfinished areas designated for future expansion.
6. Not used.

D. Level 2: At following locations, embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges:

1. Substrate for tiling.
2. Not used.

E. Level 3: At following locations, embed tape and apply separate first and second coats of joint compound to tape, fasteners, and trim flanges:

1. Mechanical, electrical, data and elevator equipment rooms.
2. Stair towers.
3. Not used.

F. Level 4: At following locations, embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges:

1. Areas to receive paint.
2. Areas to receive wall coverings.
3. Not used.

G. Level 5: At following locations, embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound or Level 5 Primer and Surfacer over entire surface:

1. Areas to receive whiteboard paint or dry erase board coatings.
2. Curved ceilings and partitions.
3. Areas as indicated on the Drawings.
4. Not used.

END OF SECTION

SECTION 10 2238

OPERABLE PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work required for this section includes operable panel partitions and supplementary items necessary to complete their installation.

1. Operable partitions shall be furnished as shown on the drawings complete with track, jambs, hardware as required for attaching track and jambs to the building structure, and supplementary items required to provide a complete and properly functioning installation. Exact construction details shall provide specified acoustical and functional performance.

B. Independent Testing Laboratory: This Section specifies testing and coordination for testing by Independent Testing Laboratory employed by Contractor and accepted by Architect.

1. Cost of Testing Laboratory Services shall be paid for by Contractor.
2. In event that system failures necessitate retesting, Contractor shall pay additional Testing Laboratory Service fees and any fees and expenses incurred by Owner and Architects as result of retesting.
3. Contractor shall be liable for any failure of the work to meet test requirements without adjustment to Contract Sum or Contract Schedule.

~~1.2 DELEGATED ENGINEERING REQUIREMENTS~~

~~A. Contract Documents Design Intent: Drawings and Specifications indicate design intent for products and systems and do not necessarily indicate or specify total Work required. Contract Documents shall not be construed as an engineered design; furnish and install all Work required for a complete installation.~~

~~B. Delegated Engineering Responsibility: Contractor shall employ a qualified professional engineer to provide engineering for products and systems including attachment to building structure required to meet design intent of Contract Documents.~~

~~1. Preparation of structural analysis data including engineering calculations, shop drawings and other submittals signed and sealed by the qualified professional engineer.~~

~~C. Delegated Engineering Professional Qualifications: Professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated for products and systems similar to this Project and has a record of successful in-service performance.~~

~~D. Coordination of Work:~~

1. ~~Product Variations: In the event of minor differences between products and systems of acceptable or available manufacturers, Contractor shall notify Architect of such differences and resolve conflicts in a timely manner. Failure of Contractor to provide notification shall be construed as acceptance of conditions indicated, and changes caused by minor differences between products and Contract Documents shall be included in the Work at no additional cost to Owner.~~
2. ~~Allowable Adjustments: Minor dimension and profile adjustments may be made in interest of fabrication or erection methods or techniques or ability to satisfy design intent, provided design intent is maintained as determined by Architect. Proposed deviations shall include a detailed analysis of impact to adjacent substrates or other building systems, including related design or construction cost impacts. If accepted by Architect, deviations causing changes in materials, constructability, substrates, or conditions shall be included in the Work at no additional cost to Owner.~~

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.
2. Include data on acoustical performance, surface-burning characteristics, and durability.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work.

1. Show location and extent of operable panel partitions. Include plans, elevations, sections, details, numbered panel installation sequence, attachments to other construction, and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel.

    a. Calculate requirements for supporting operable panel partitions and verify capacity of carriers and track components to support loads; indicate deflection limits for partition and adjacent construction.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Items penetrating finished ceiling, including the following:

    a. Lighting fixtures.
    b. HVAC ductwork, outlets, and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Smoke detectors.
    f. Access panels.

4. Plenum fire and acoustical barriers.

D. Setting Drawings: For embedded items and cutouts required in other work, including support beam punching template.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color, pattern or texture variations, include sample sets showing the full range of variations expected.

1. Panel Facing Material: Manufacturer's standard-size unit, not less than 3 inches (75 mm) square.
2. Panel Edge Material: Not less than full width by 6 inches (150 mm) long.
3. Hardware: Mechanically operated bottom seal operating device.

1.4 INFORMATIONAL SUBMITTALS

A. Delegated Engineering Calculations: Informational submittal for products indicated to comply with design loads, include structural analysis data signed and sealed by the approved qualified engineer responsible for their preparation; test reports are not acceptable substitute for calculations.

B. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by an approved qualified testing laboratory indicating that each product complies with requirements.

C. Field Quality Control Reports: Written report of testing and inspection required by "Field Quality Control".

1. After completion of installation, submit field sound transmission test data on installed work as specified hereinafter.

D. Manufacturer’s Project Acceptance Document: Certification by the manufacturer that its products and systems are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.

E. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

F. Warranty: Sample of warranty.

1. Provide manufacturer’s written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: To include in maintenance manuals.

1. User Guide: Furnish Owner with three (3) copies of complete brochure including recommended maintenance procedures, spare parts list, operating instructions and name and address of nearest service agent.
2. Panel face finishes and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
3. Seals, hardware, track, carriers, and other operating components.
4. Electric operator and controls.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Panel-Face Finish Material: Furnish full-width in quantity to cover both sides of tallest two panels when installed.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance service by Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Provide parts and supplies as used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 10 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.

C. Fire-Test-Response Characteristics: Provide operable panel partitions with the following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:

    a. Flame Spread: 25 or less.
    b. Smoke Developed: 450 or less.

2. Fire Growth Contribution: Textile wall coverings complying with the acceptance criteria of local building code requirements.

D. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

    a. Show typical components, attachments to building structure, and requirements of installation.

2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.9 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site to comply with requirements of applicable Division 01 Sections.

1. Participants:

    a. Architect.
    b. Contractor, including superintendent.
    c. Installer, including project manager and supervisor.
    d. If requested, Manufacturer’s qualified technical representative.
    e. Installers of other construction interfaced with Work.
    f. Contractor’s Independent Testing Laboratory.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

    a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
    b. Review Contract Document requirements.
    c. Review approved submittals.
    d. Review inspection and testing requirements.
    e. Review environmental conditions and procedures for coping with unfavorable conditions.

f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.10 PROJECT CONDITIONS

A. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1. Operable partition shall be installed to close across area with smooth floor surface, with variance less than or equal to 1/8 inch (3 mm).
2. Preparation of opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions. Plenum barrier construction shall provide an STC rating greater than or equal to that of scheduled Operable Partitions.

1.11 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of operable panel partitions.
b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Manufacturer's Warranty: Furnish manufacturer's written material and labor warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials and labor required to repair or replace work which exhibits material defects caused by manufacture or design and installation of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Faulty operation of operable panel partitions
c. Deterioration of metals, metal finishes and other materials beyond normal wear.

2. Warranty Period: Manufacturer shall warrant the products to be free from material and labor Defects for the following period of years from date of issuance of The Certificate of Substantial Completion.

a. Panel Warranty Period:

1) Base Bid: 2 years.

2) Alternate Bid: 10 years.

b. Trolley and Mechanically Operated Retractable Seals: 10 years.
c. Track, Brackets, Switches and Curves: 10 years.
d. Fixed Horizontal Top Seals: Lifetime of installation

C. Installer's Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.

1. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 2 years from date of issuance of The Certificate of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

1. Manufacturers and Products - Ballrooms:

a. Advanced Equipment Corporation; Alpha Series, Type U.
b. Hufcor Inc.; 641 Series, Track 11.
c. Modernfold Inc.; Encore Series, Track 14.

2. Manufacturers and Products - Meeting Rooms:

a. Advanced Equipment Corporation; Alpha Series, Type T.
b. Hufcor Inc.; 631 Series, Track 11.
c. Modernfold Inc.; Encore Series, Track 14.

C. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

1. Manufacturer and Product: Modernfold, Inc.; Encore Series

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

A. General Performance: Engineer products and systems to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated and without permanent deformation or failure of materials.

B. Design Loads: Engineer to withstand design loads including but not limited to gravity, wind, seismic, and erection design loads and thermal movements established by authorities having jurisdiction, applicable local building codes, and as indicated.

1. Structural Movement: Engineer to withstand movements of structure including, but not limited to, drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads. Contractor shall obtain required design data and identify movements accommodated on submittal drawings.

a. Review partition loading with Architect to verify that allowable deflection of supporting structure will not restrict partition operation nor affect partition acoustics

2. Deflection of Supporting Structure: Operable panel wall system shall be capable of withstanding building movements within the following limitations:

a. Total Deflection - Ballrooms: Not to exceed 1.5 inch (38 mm).
b. Total Deflection - Meeting Rooms: Not to exceed 0.75 inch (19 mm).
c. Total Deflection: Not to exceed 0.75 inch (19 mm).

C. Acoustical Characteristics:

1. Noise Isolation Class (NIC): Manufacturer shall submit results of Noise Isolation Class (NIC) tests conducted by an independent testing agency of the same type wall systems, and of similar height and width, in accordance with ASTM E336-90.

a. Single Partitions: Refer to schedule at end of this section.

2. Sound Transmission Class (STC): Manufacturer shall submit Laboratory test data performed in accordance with ASTM E90 and E413.

a. Single Partitions: Refer to schedule at end of this section.
b. STC: Not less than 52.

D. Dimensional Tolerances: Engineer products and systems to accommodate dimensional tolerances of framing members and adjacent construction.

2.4 MATERIALS

A. Steel Frame: Steel sheet, not less than 0.0598 inch (1.5 mm), 16 gage nominal specified thickness for uncoated steel.

B. Aluminum Trim: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B 221 for extrusions; manufacturer's standard strengths and thicknesses for type of use.

C. Steel Face/Liner Sheets: Tension-leveled steel sheet, not less than nominal specified thickness for uncoated steel.

2.5 OPERABLE PANEL PARTITIONS

A. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

1. Panel Faces: Tension-leveled steel sheet, minimum 16 gage nominal thickness or 18 gage nominal thickness; with laminated gypsum backer panel.

B. Dimensions: Fabricate operable panel partitions, from manufacturer's standard sizes, to form an assembled system of dimensions indicated on Drawings and verified by field measurements.

C. Cap-Trimmed Edges: If applicable, protective aluminum top and bottom edge trim with tight hairline joints concealing edges of panel and finish facing. One of the following as selected by Architect:

1. Anodized Finish: Manufacturer's standard clear anodized.
2. Powder Coat Finish: Manufacturer's standard baked polymer thermosetting powder finish.

D. Vertical Trimless Edges: Fabricate vertical exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

E. Operable Panel Partition Characteristics:

1. Each partition shall consist of panels of steel frame construction with internal glass fiber fill and sound barrier septum, as required, to achieve the specified design criteria. Panel construction shall be fabricated from formed steel with overlapped and welded corners for rigidity. Top channel shall be reinforced to support suspension system components.
2. Individual panels shall have roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction.

F. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

G. Panel Thickness: As scheduled at the end of this section.

2.6 SEALS

A. General: Provide types of acoustical seals that produce operable panel partitions complying with acoustical performance requirements and the following:

1. Seals made from materials and profiles that minimize sound leakage.
2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended, closed, and in place.

B. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.

C. Horizontal Top Seals: Continuous contact extruded vinyl bulb shaped sweeps with pairs of non-contacting vinyl fingers or PVC-faced, mechanical, constant-force-contact seal exerting uniform constant pressure on track when extended, ensuring horizontal and vertical sealing and resisting panel movement.

D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.

1. Mechanically Operated: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range and required operating clearance between retracted seal and floor finish. Partition manufacturer shall confirm deflection requirements to confirm bottom seal operating clearance and requirements.

a. Horizontal Bottom Drop Seals: As scheduled at the end of this section.

2.7 FINISH FACING

A. General: Install finish facings that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.

1. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with invisible seams complying with Shop Drawings for location, and with no gaps or overlaps. Horizontal butted edges and seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
3. Match facing pattern 72 inches (1800 mm) above finished floor.

B. Vinyl-Coated Fabric Wall Covering: Manufacturer's standard, mildew-resistant, washable, vinyl-coated fabric wall covering; complying with CFFA-W-101-D for type indicated; Class A.

1. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.

2.8 SUSPENSION SYSTEMS

A. Suspension Tracks: Steel tracks with steel running surfaces and adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.5 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum; finished with factory-applied, decorative, protective finish.
2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish selected by Architect from manufacturer's full range.

B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with precision ground, sealed, ball-bearing, steel-tired wheels. Trolley shall be pre-programmed at the factory to allow automatic indexing of panels into pocket areas.

C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partition and compatible with partition assembly specified. Fabricate track intersections and switches from steel with steel running surfaces. Track design will incorporate smooth switches and curves to accommodate pre-programmed automatic indexing trolleys.

D. Aluminum Finish: Clear anodized, factory-applied, decorative finish, unless otherwise indicated.

E. Steel Finish: Factory-applied, corrosion-resistant, protective coating, unless otherwise indicated.

2.9 ELECTRIC OPERATORS

A. General: Factory-assembled electric operation system of size and capacity recommended and provided by operable panel partition manufacturer for partition specified; with electric motor and factory-prewired motor controls, speed reducer, chain drive, control stations, control devices, and accessories required for operation. Include wiring from control stations to motor. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Comply with NFPA 70.

C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.

D. Motor Electrical Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, within installed environment, with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1.

E. Control Stations: Two single-key-operated, constant-pressure control stations located remotely from each other on opposite sides and opposite ends of partition run. Wire in series to require simultaneous activation of both key stations to operate partition. Each three-position control station labeled "Open," "Close," and "Off." Furnish two keys per station.

F. Obstruction-Detection Devices: Equip each motorized operable panel partition with indicated automatic safety sensor that causes operator to immediately stop and reverse direction.

1. Sensor Edge: Contact-pressure-sensitive safety edge along partition's leading edge.
2. Sensor Mat: Electrically operated, contact-weight-sensitive safety mat in storage pocket area.

G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop operable panel partition at fully extended and fully stacked positions.

H. Emergency Release Mechanism: Quick disconnect-release of electric-motor drive system, permitting manual operation in event of operating failure.

I. Electric Interlock: Equip each motorized operable panel partition with electric interlocks at locations indicated, to prevent operation of operable panel partition under the following conditions:

1. On storage pocket door, to prevent operation if door is not in fully open position.
2. On partitions at location of convergence by another partition, to prevent operation if merging partitions are in place.

2.10 ACCESSORIES

A. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware. Hinges in finish to match other exposed hardware. Provide pocket door configuration that allows partition seal to back of pocket.

1. Rim Lock: Deadlock to receive cylinder, to secure storage pocket door in closed position. See Division 08 section "Door Hardware" for lock cylinder and keying requirements.

B. Pass Door; Single Leaf:

1. Pass Door: Matching pass door same thickness and appearance as partition panels. ADA compliant pass door shall be trimless and equipped with lever latch and push bar for panic operation. Threshold will not be permitted.
2. Closers: Concealed automatic door closures with full 180 degree opening range and hold open capability.
3. Exit Signs: Self illuminated chemical exit signs.
4. Panic Hardware: Recessed lever latch and recessed push bar. Surface mount push bar is not permitted. Push/pull knob or drop ring latch is not permitted.
5. Hinges: SOSS invisible hinges. Barrel or piano hinges are not permitted.
6. Trimless: Perimeter trim around door is not permitted. Splice in panel face at top of door is not permitted.
7. Viewer: Recessed door viewer.
8. Deadbolt Lock: Prepare door for lock cylinder.
9. Seals: Operable seals in door and adjacent panel legs, operable from edge of panel and door. Face operated seals on door or panel leg are not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

B. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.

1. The operable wall sub-contractor shall take responsibility for the ceiling/floor void barriers, interfaces with walls, etc and other associated constructions which may form possible significant noise flanking paths (if deemed necessary by the sub-contractor). These constructions shall be designed and installed such that the overall site sound separation performance requirements are met. The sub-contractor shall include the associated works within the sub-contract and/or approve the design and site installation of the associated constructions, prior to site level difference testing, sufficient for the sub-contractor to guarantee overall performance without doubt as to contractual responsibilities.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Comply with ASTM E 557.
2. Respective manufacturer's written installation instructions.
3. Accepted submittals.
4. Contract Documents.

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF OPERABLE PANEL PARTITIONS

A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

B. Installation personnel, experienced in the erection of the particular operable wall system furnished, shall be closely supervised by technician employed directly by the partition manufacturer.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.

B. Testing Laboratory Field Service: Contractor shall engage and pay an approved qualified independent testing laboratory to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.

1. Upon completion of this portion of the work, and prior to its acceptance by the Owner, the partition shall be set up by the manufacturer and field sound tested. Test price shall be included in the bid price. Prior to testing the operable partitions, the Architect and the partition manufacturer's representative will examine flanking paths through the surrounding building construction to determine that they will not significantly affect the performance of the operable partitions. The manufacturer shall complete the test with the Owner's Representative in attendance and shall make partition adjustments as required.
2. Light Leakage Testing: Illuminate one side of partition installation and observe vertical joints and top / bottom seals; adjust partitions to eliminate voids.
3. Noise Isolation Class (NIC) Testing: Perform testing of installed operable panel partitions for noise isolation according to ASTM E 336, determined by ASTM E413, and rated for not less than NIC indicated. Adjust partitions to comply with requirements.
4. Extent of Testing: Testing agency shall randomly select partition installation for testing.
5. Repair or replace partitions where test results indicate partitions do not comply with requirements; retest partitions.
6. Additional testing and inspections, at Contractor's expense, shall be performed to determine compliance with requirements.

3.6 ADJUSTING

A. Adjust operable panel partitions and pocket doors to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

B. Electric Operator: Adjust operable panel partitions, hardware, electric operator, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.

C. Storage Pocket Doors: Adjust storage pocket doors to operate smoothly and easily, without binding or warping.

D. Pass Doors: Adjust pass doors to operate smoothly and easily, without binding or warping.

3.7 CLEANING AND PROTECTION

A. Clean soiled surfaces on completing installation of operable panel partitions, to remove dust, adhesives, and other foreign materials according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure operable panel partitions are without damage or deterioration at time of Substantial Completion.

C. Replace panels that cannot be cleaned and repaired, in a manner accepted by Architect, before time of Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

1. Test and adjust seals, hardware, carriers, tracks, and other operable components. Replace damaged or malfunctioning operable components.
2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
3. Review data in maintenance manuals. Refer to Division 01 Section "Closeout Procedures".

A. **OPERABLE PANEL PARTITION SCHEDULE:** See Interior Finish Legend on drawings.

END OF SECTION

SECTION 12 3553

LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work required for this section includes metal laboratory casework with stainless steel and phenolic countertops along with supplementary items necessary to complete their installation.

B. Related Section:

1. Division 06 Section "Interior Architectural Woodwork" for shop-fabricated plastic laminate-clad and wood veneer-clad casework, millwork, and cabinetry.

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work.

1. Indicate locations of hardware and keying of locks.
2. Indicate locations and types of service fittings.
3. Indicate locations of blocking and reinforcements required for installing laboratory casework.
4. Include details of utility spaces showing supports for conduits and piping.
5. Include details of exposed conduits, if required, for service fittings.
6. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
7. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For factory-applied finishes and other materials requiring color selection.

D. Samples for Verification: Unless otherwise directed, approved full-size Samples may become part of the completed Work, if in an undisturbed condition at time of Substantial Completion. Notify Architect of their exact locations. If not incorporated into the Work, retain acceptable full-size Samples at Project site and remove when directed by Architect.

1. One full-size, finished base cabinet complete with hardware, doors, and drawers.
2. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.
3. One Sample each of hinged and sliding doors.
4. 6-inch- (150-mm-) square Samples for each type of countertop material.
5. One of each service fitting specified, complete with accessories and specified finish.

6. One of each type of sink and accessory item specified.
7. One of each type of hardware item specified.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.

C. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

D. Field Quality Control Reports: Written report of testing and inspection required by "Field Quality Control".

1.4 CLOSEOUT SUBMITTALS

A. Furnish complete touchup kit for each type and color of metal laboratory casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

B. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.

C. Casework Product Standard: Comply with SEFA 8, "Laboratory Furniture - Casework, Shelving and Tables - Recommended Practices."

D. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by FM Approvals.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.

    a. Show typical components, attachments to building structure, and requirements of installation.

2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.6 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

    a. Architect.
    b. Contractor, including superintendent.
    c. Installer, including project manager and supervisor.
    d. If requested, Manufacturer's qualified technical representative.
    e. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

    a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
    b. Review Contract Document requirements.
    c. Review approved submittals.
    d. Review inspection and testing requirements.
    e. Review environmental conditions and procedures for coping with unfavorable conditions.
    f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1. Obtain countertops, sinks, accessories, and service fittings from casework manufacturer.

~~2.2 METAL CABINET MATERIALS~~

~~A. Metal: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.~~

~~2.3 AUXILIARY CABINET MATERIALS~~

~~A. Acid Storage-Cabinet Lining: 1/4-inch- (6-mm-) thick, glass-fiber cement board complying with ASTM C 1186, polyethylene or polypropylene, or polyethylene, polypropylene, epoxy, or phenolic-composite lining material.~~

~~B. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.~~

~~C. Frameless Glass Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick; with exposed edges seamed before tempering.~~

2.4 CABINET AND COUNTERTOP MATERIALS

A. Phenolic Composite: Solid, high-pressure decorative laminate, complying with NEMA LD 3, Grade CGS.

1. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

   a. Arbonite; a division of ITW Canada.
   b. Epoxyn Products.
   c. Formica Corporation.
   d. Nevamar Company, LLC.
   e. NuLab Furniture Corporation.
   f. Panolam Industries International Incorporated; Pionite Decorative Surfaces.
   g. Trespa North America.

2. Chemical Resistance: Composite countertop material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

   a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, formaldehyde (37 percent), furfural, hydrochloric acid (37 percent), hydrofluoric acid (48 percent), nitric acid (30 percent), phosphoric acid (85 percent), sodium hydroxide (20 percent), sulfuric acid (33 percent), toluene, and zinc chloride.

3. Color: As selected by Architect from manufacturer's full range.

2.5 SINK MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

2.6 METAL CABINETS

~~A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".~~

~~1. Keur Industries, Inc.~~
~~2. Kewaunee Scientific Corporation; Laboratory Products Group.~~
~~3. Lab Design/United Hospital Supply Corp.~~
~~4. Mott Manufacturing Ltd.~~
~~5. Thermo Fisher Scientific (formerly Fisher Hamilton).~~

~~B. Fabrication: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt and vermin-resistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).~~

C. Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.

D. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.

E. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.

F. Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.

G. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.

H. Toe Space: Fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.

I. Tables: Welded tubing legs, not less than 2 inches (50 mm) square with channel stretchers as needed to comply with product standard. Weld or bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device welded to bottom of each leg.

1. Leg Shoes: Satin-finished stainless steel, open-bottom, slip-on type.

J. Utilities: Provide space, cutouts, and holes for pipes, conduits, and fittings in cabinet bodies to accommodate utility services and their support-strut assemblies.

1. Provide base cabinets with removable backs for access to utility space.

K. Utility-Space Framing: Laboratory casework manufacturer's standard steel framing units consisting of 2 steel slotted channels complying with MFMA-4, not less than 1-5/8 inches (41 mm) square by 0.105-inch (2.66-mm) nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.

L. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges unless otherwise indicated.

1. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
2. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.
3. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed. Fabricate from back-to-back panels or of hollow construction to eliminate exposed hemmed or flanged edges.

~~2.7 METAL CABINET FINISH~~

~~A. General: Prepare, treat, and finish welded assemblies after assembling. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.~~

~~B. Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.~~

~~C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply laboratory casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).~~

~~1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.~~
~~2. Colors for Metal Laboratory Casework Finish: As selected by Architect from manufacturer's full range.~~

2.8 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches (1200 mm) high or less and 3 for doors more than 48 inches (1200 mm) high.

C. Hinged Door and Drawer Pulls: Solid aluminum, stainless steel, or chrome-plated brass back-mounted pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.

1. Design: Wire pulls.
2. Overall Size: 1-3/8 by 5-1/2 inches (35 by 140 mm).

D. Sliding Door Pulls: Stainless-steel or chrome-plated recessed flush pulls.

1. Design and Size: Oval, 1 by 3 inches (25 by 76 mm), 3/8 inch (10 mm) deep.

E. Pulls: Recessed aluminum pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.

F. Pulls for Metal Cabinets: Full-width, recessed channel pulls; integrally formed from front pan of doors and drawer fronts.

G. Door Catches: Nylon-roller spring catches. Provide 2 catches on doors more than 48 inches (1200 mm) high.

H. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1HD-100; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
2. Provide Grade 1HD-200; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
3. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.

I. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches (25 by 50 mm), attached with screws or rivets. Provide on all drawers.

J. Locks for Metal Cabinets: Cam or half-mortise type, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.

1. Provide a minimum of two keys per lock and two master keys.
2. Provide on all drawers and doors.
3. Keying: Key locks alike within each room; key each room separately.
4. Master Key System: Key all locks to be operable by master key.

K. Sliding-Door Hardware Sets: Laboratory casework manufacturer's standard, to suit type and size of sliding-door units.

L. Adjustable Wall Shelf Supports: Surface-type steel standards and steel shelf brackets, with epoxy powder-coated finish, complying with BHMA A156.9, Types B04102 and B04112.

2.9 COUNTERTOPS AND SINKS

A. Phenolic-Composite Countertops:

1. Countertop Fabrication: Fabricate with cutouts for sinks, holes for service fittings and accessories, and with butt joints assembled with epoxy adhesive and concealed metal splines.

   a. Countertop Configuration: Flat, 3/4 inch (19 mm) thick, with beveled edge and corners, and with drip groove and integral coved backsplash.
   b. Countertop Configuration: As indicated.

2. Table-Top Fabrication:

   a. Table-Top Configuration: Flat, 1 inch (25 mm) thick, with beveled edge and corners, and with drip groove at perimeter.

3. Shelf Configuration: Flat, 3/4 inch (19 mm) thick, with beveled edge and corners.

B. Stainless-Steel Sinks: Made from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Slope sink bottoms to outlet. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch (13-mm) diameter. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish as needed to produce uniform finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

1. Punch holes for fittings at factory.

2. Provide with stainless-steel strainers and tailpieces.
3. Provide with integral rims except where located in stainless-steel countertops.
4. Apply 1/8-inch- (3-mm-) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

C. Cup Sinks: Material and size as indicated.

1. Provide epoxy cup sinks with polypropylene strainers and integral tailpieces.
2. Provide stainless-steel cup sinks with stainless-steel strainers and integral tailpieces.

D. Troughs: Epoxy or stainless steel, as indicated. Pitch to drains not less than 1/8 inch/foot (10 mm/m). Except where troughs empty into sinks, provide NPS 1-1/2 (DN 40) outlets with strainers and tailpieces.

1. Epoxy Troughs: Molded in 1 piece with smooth surfaces and coved corners; 3/4-inch (19-mm) minimum thickness. Provide polypropylene strainers and tailpieces.
2. Stainless-Steel Troughs: Made from stainless-steel sheet, not less than 0.062-inch (1.59-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish as needed to produce uniform finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean. Provide stainless-steel strainers and tailpieces.

2.10 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section ‘‘Substitution Procedures’’.

1. Broen A/S.
2. Chicago Faucet Company (The); a Geberit Company.
3. WaterSaver Faucet Co.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.

1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

D. Finish: Chromium plated unless otherwise indicated.

1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.

2. Where indicated, provide acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.

E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).

1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
3. Self-Closing Valves: Provide self-closing valves where indicated.

F. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig (280 kPa), with serrated outlets.

G. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than 5 lbf (22 N) to operate. Provide units designed for working pressure up to 75 psig (520 kPa), with serrated outlets.

1. Where ball valves are indicated for fuel-gas use, provide locking safety handles that must be pushed in or pulled up before being turned on unless otherwise indicated].

H. Steam Valves: Stainless-steel seat and PTFE seat disc. Provide units designed for steam working pressure up to 20 psig (140 kPa), with serrated outlets.

I. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.

1. Provide units designed for working pressure as indicated on drawings.

J. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."

K. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

L. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.

1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
3. Provide knurled, molded plastic handles for needle valves.

M. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.11 ELECTRICAL SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, terminals, switches, pilot lights, device plates, accessories, and gaskets required for mounting on laboratory casework.

B. Receptacles: Comply with NEMA WD 1, NEMA WD 6, and UL 498. Duplex type, Configuration 5 20R.

1. Receptacle Grade: Hospital grade unless otherwise indicated.
2. Color of Receptacles: As selected by Architect unless otherwise indicated or required by NFPA 70.
3. GFCI Receptacles: Straight blade, feed-through or non-feed-through type. Comply with UL 943, Class A, Hospital grade, and include indicator light that is lighted when device is tripped.
4. TVSS (Transient Voltage Surge Suppressor) Receptacles: Comply with UL 1449, with integral TVSS in line to ground, line to neutral, and neutral to ground.

    a. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and a minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
    b. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
    c. Receptacle Type: Hospital grade, with isolated-ground terminal.
    d. Identification: Distinctive marking on face of device to denote TVSS-type unit.
    e. Color of TVSS Receptacles: Blue.

C. Switches: Comply with NEMA WD 1 and UL 20. Provide single-pole, double-pole, or 3-way switches as required; rated 120 to 277-V ac; and in amperage capacities to suit units served.

1. Color of Switches: As selected by Architect unless otherwise indicated or required by NFPA 70.
2. Provide pilot light adjacent to switch or neon-lighted handle, illuminated when switch is "ON," where noted as "PL" next to switch identification.
3. Provide key-operated switch where noted as "KEY" next to switch identification.
4. Provide thermal-overload switches, single or double pole, as required, with maximum overcurrent trip setting to suit particular motor controlled.

D. Pedestal-Type Fittings: Cast-aluminum housings with sloped single face or two faces, as indicated, with neoprene gasket under base and with concealed mounting holes in base for attaching to laboratory casework. Provide holes tapped for conduits.

E. Line-Type Fittings: Provide with cast-metal boxes with threaded holes for mounting on rigid steel conduit. Provide cover plates same size as boxes.

F. Recessed-Type Fittings: Provide with galvanized-steel boxes.

G. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

H. Cover Plates: Provide satin finish, Type 304, stainless-steel cover plates with formed, beveled edges.

I. Cover-Plate Identification: Use 1/4-inch- (6-mm-) high letters unless otherwise indicated. For stainless steel or chrome-plated metal, stamp or etch plate and fill in letters with black enamel.

1. Provide at the following locations:

a. Receptacles other than standard 125-V duplex, grounding type.
b. Switches and thermal-overload switches.
c. Pilot lights when located remotely from associated equipment or switch, where function is not obvious.
d. Receptacles, switches, and other locations indicated.

2. Provide the following information:

a. Voltage and phase for receptacles other than standard 125-V duplex, grounding type.
b. Indicate equipment being controlled by switches and thermal-overload switches.
c. Indicate equipment being controlled for pilot lights when located remotely from associated equipment or switch, where function is not obvious.
d. Number of breaker in panelboard that controls device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer/fabricator's written installation instructions.
2. Accepted submittals.
3. Contract Documents.

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches (600 mm) o.c. and at sides of cabinets with not less than 2 fasteners per side.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches (600 mm) o.c.

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

F. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.5 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:

1. Secure countertops, except for epoxy countertops, to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches (1200 mm) o.c.
3. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Seal unfinished edges and cutouts in plastic-laminate countertops with heavy coat of polyurethane varnish.

F. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

G. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.6 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

C. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not prepared in shop. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

D. Drop-in Installation of Epoxy Cup Sinks: Rout groove in countertop to receive sink rim if not prepared in shop. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

3.7 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.8 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.

B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.

3.10 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

END OF SECTION

SECTION 12 3571

STAINLESS STEEL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes stainless-steel healthcare casework and supplementary items necessary for installation for the following:

1. Stainless steel casework.
2. Stainless-steel countertops, shelves, and sinks.
3. ~~Specialty Cabinets:~~

   a. ~~Narcotics Cabinets.~~
   b. ~~Specimen Pass-Through Cabinets.~~
   c. ~~Warming Cabinets.~~
   d. ~~Desk Units.~~

1.2 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work.

1. Indicate locations of blocking and reinforcements required for installing casework.
2. Indicate hardware locations.
3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
4. Include coordinated dimensions for equipment specified in other Sections.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

D. Samples for Verification: For each type of exposed hardware indicated, in full-size units.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.

B. Installer Qualifications:

1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.

1.5 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".

~~B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.~~

1. Jamestown Metal Products.
2. MASS Medical Storage.
3. STERIS Corporation.

2.2 MATERIALS, GENERAL

A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 CASEWORK MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, stretcher-leveled standard of flatness.

B. Nominal Stainless-Steel Thicknesses for Stainless-Steel Healthcare Casework:

1. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: 0.050 in (1.25). Bottoms may be 0.038 in (0.95 mm) if reinforced.
2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.038 in (0.95 mm) except 0.050 in (1.25 mm) for unreinforced shelves more than 36 in (900 mm) long.
3. Intermediate Horizontal Rails, Center Posts, Tubular Legs, and Top Gussets: 0.062 in (1.59 mm).
4. Drawer Runners and Hinge Reinforcements: 0.078 in (1.9 mm).
5. Leveling and Corner Gussets: 0.109 in (2.7 mm).

C. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

D. Clear Tempered Glass Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; 6.0 mm thick; with exposed edges seamed before tempering.

E. Pegboard: Provide one or both of the following types as indicated on drawings:

1. Type 1: 1/4 in (6 mm) perforated hardboard, complying with ANSI A135.4, Class 1 tempered; with painted finish sealing faces, edges, and perimeter of holes.
2. Type 2: Perforated stainless-steel sheet, 0.050 in (1.25 mm) nominal thickness.

F. Insulation for Warming Cabinets: Semirigid, glass-fiber board insulation complying with ASTM C 612, Type IA or Type IB.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 CABINET FABRICATION

A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt- and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 in (1.5 to 2.4 mm).

B. Metal Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.

C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.

D. Hinged Doors: Mortise doors for hinges and reinforce with angles welded inside inner pans or hollow-metal stiles at hinge edge.

E. Metal Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal.

F. Metal Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels. Provide clips, brackets, pilasters, or other means to support shelves from cabinet ends and to allow height of shelves to be adjusted in increments of not more than 2 in (50 mm).

G. Sloping Tops: Unless tops are concealed by other construction, provide sloping tops on cabinets with tops 60 in (1500 mm) or more above the finished floor. Slope tops 25 degrees or more and construct of same material and with same finish as cabinets.

H. Toe Space: Unless casework is built-in, provide metal toe space, fully enclosed, 4 in (100 mm) high by 3 in (75 mm) deep, with no open gaps or pockets.

I. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges.

J. Trim Flanges: Formed metal trim fabricated from same material and with same finish as cabinets. Provide at perimeter of recessed cabinets.

2.5 STAINLESS-STEEL COUNTERTOPS, SHELVES, AND SINKS

A. Countertops: Fabricate from 0.062 in (1.59 mm) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 in (25 mm) over the base cabinets.

1. Joints: Fabricate countertops without field-made joints.
2. Weld shop-made joints.
3. Sound-deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1 in (25 mm) thick edge with a 1/2 in (12 mm) return flange.
5. Form the backsplash coved to and integral with top surface, with a 1/2 in (12 mm) thick top edge and 1/2 in (12 mm) return flange.
6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
7. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.

B. Wall-Mounted Shelves: Fabricate from stainless-steel sheet, not less than 0.050 in (1.25 mm) nominal thickness. Weld shop-made joints. Fold down or up, as indicated on drawings, the front edge a minimum of 3/4 in (19 mm); fold up the back edge a minimum of 3 in (75 mm). Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 in (19 mm) and by welding to upturned back edge.

C. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050 in (1.25 mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8 in (15 mm) radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.

1. Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2 in (12 mm) diameter.
3. Factory punch holes for fittings.
4. Provide sinks with stainless-steel strainers and tailpieces.
5. Provide sinks with integral rims except where located in stainless-steel countertops.
6. Apply 1/8 in (3 mm) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

~~2.6 SPECIALTY CABINETS~~

~~A. Narcotics Cabinets: Construct of stainless steel as individual, freestanding units with finished sides and top and double-walled bottom. Provide with double-pan flush outer door and 0.062 in (1.59 mm) nominal thickness, single-pan inner door, both with locks; each is individually keyed and not master keyed.~~

~~B. Specimen Pass-Through Cabinets: Construct of stainless steel as through-wall units with double-walled construction and smooth interior. Provide with double-pan flush doors with interlocking hardware that prevents each door from being opened when the other door is open. Provide with removable, stainless-steel spill tray and trim flanges for both faces.~~

~~C. Warming Cabinets: Recessed units covered on back, top, and sides with 1 in (25 mm) thick insulation. Insulate double-pan door and equip with heat-resistant gasket. Provide with thermostatically controlled heating system to maintain temperature within 10 deg. F (-9.4 deg. C) of temperature setting that can be varied from 97 to 160 deg. F (36 to 71 deg. C).~~

~~1. Equip units with fan-forced electric heating system.~~

~~D. Desk Units: Recessed units with sloped stainless-steel writing surface, magnetic stainless-steel back panel, and built-in fluorescent light fixture.~~

~~1. Provide drawers under the writing surface as indicated.~~
~~2. Provide keyboard drawer under the writing surface and provide drawers and space for CPU under keyboard drawer as indicated. Provide rack or articulated arm, as indicated on drawings, for monitor over the writing surface.~~

2.7 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional-satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

2.8 CABINET HARDWARE

A. General: Provide healthcare casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide two hinges for doors 48 in (1200 mm) high or less, and provide three for doors more than 48 in (1200 mm) high.

C. Continuous Hinges: Stainless-steel continuous hinges complying with BHMA A156.9, Grade 1. Provide for specialty cabinets.

D. Hinged Door and Drawer Pulls: Back-mounted pulls of stainless steel.

1. Design: As selected from manufacturer's full range.
2. Overall Size: As selected from manufacturer's full range.

E. Sliding Door Pulls: Recessed flush pulls of stainless steel or chrome plated. Provide two pulls for drawers more than 24 in (600 mm) wide.

1. Design and Size: As selected from manufacturer's full range.

F. Door Catches: Nylon-roller spring catches. Provide two catches on doors more than 48 in (1200 mm) high.

G. Drawer Slides: Side-mounted, epoxy-coated-steel, self-closing, ball-bearing drawer slides; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1 for drawers not more than 6 in (150 mm) high and 24 in (600 mm) wide.
2. Provide Grade 1HD-100 for drawers more than 6 in (150 mm) high or 24 in (600 mm) wide.
3. Provide Grade 1 for computer keyboard drawers.
4. Provide full-extension type where Grade 1 is indicated.
5. Provide full-extension type where Grade 1HD-100 or Grade 1HD-200 is indicated.

H. Locks: Cam or half-mortise type; brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.

1. Provide minimum of two keys per lock and two master keys.
2. Provide locks where indicated.
3. Keying: Key locks as directed.
4. Master Key System: Key all locks to be operable by master key.

I. Sliding-Door Hardware Sets: Healthcare casework manufacturer's standard, to suit type and size of sliding-door unit.

PART 3 - EXECUTION

A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. Respective manufacturer written installation instructions.

2. Accepted submittals.
3. Contract Documents.

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

3.3 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 INSTALLATION OF CABINETS

A. Install cabinets level, plumb, and true; shim as required, using concealed shims. Where healthcare casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 in in 10 feet (1.5 mm in 3 m).
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 in in 10 feet (3 mm in 3 m).
3. Variation of Faces of Cabinets from a True Plane: 1/8 in in 10 feet (3 mm in 3 m).
4. Variation of Adjacent Cabinet Surfaces from a True Plane (Lippage): 1/32 in (0.8 mm).
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 in (1.5 mm).

B. Recessed Cabinets: Set cabinets in openings and fasten to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 in (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

C. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 16 in (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through the back, near the top, at not less than 16 in (400 mm) o.c.

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

F. Adjust healthcare casework and hardware so doors and drawers align and operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.5 INSTALLATION OF COUNTERTOPS

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 in (600 mm) o.c.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.

3.7 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6 mil (0.15 mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 in (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION

SECTION 32 1700

PAVING SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work under this section of the Specifications includes all labor, materials, equipment, and services necessary for PAVING SPECIALTIES as shown on the Drawings and herein specified and in accordance with the Contract Documents. All costs for labor, materials, equipment, and services necessary for PAVING SPECIALTIES shall be included in the bid prices for the work.

1.03 SECTION INCLUDES

A. Parking Bumpers
B. Pavement Markings
C. Preformed Traffic-Calming Devices

1.04 RELATED SECTIONS

A. 32 12 00 Flexible Paving
B. 32 13 00 Rigid Paving
C. 32 13 73 Concrete Paving Joint Sealants
D. 32 16 13 Concrete Curbs and Gutters

1.05 DEFINITIONS

A. AHJ – Authority Having Jurisdiction

1. City of Tahlequah

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For Pavement Markings.

1. Indicate Pavement Markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.07 QUALITY ASSURANCE

A. PRECONSTRUCTION CONFERENCE

1. Conduct a preconstruction conference. Subcontractors that will be performing the work shall attend the preconstruction conference.

B. REGULATORY REQUIREMENTS

1. All materials and methods shall comply with the requirements of the AHJ.
2. If the AHJ has not adopted specifications for materials and methods, the Oklahoma Department of Transportation's 2009 Specifications shall be used.

1.08 CONSTRUCTION CONTROL

A. Do not commence work until temporary erosion and sedimentation control measures are in place.

B. CONTRACTOR shall be responsible for properly laying out the work, and for lines and measurements for the work executed under the Contract Documents. Verify the figures shown on the Drawings before ordering any materials and laying out the work, and report errors or inaccuracies in writing to the ENGINEER before commencing work. The ENGINEER or his representative will in no case assume the responsibility for laying out the work.

C. Existing survey points other than those shown on the Drawings shall not be considered as acceptable control points unless approved by the ENGINEER. If approval is secured, CONTRACTOR remains responsible for maintaining them and for their accuracy. Be responsible for preserving all existing iron or metal, and all concrete survey points or monuments for the construction period.

1.09 PROJECT CONDTIONS

A. TRAFFIC

1. Obtain any Work Zone Permits required from the AHJ at least two (2) working days prior to the start of work and/or placing or removing any barricades or modifying existing traffic control devices.
2. CONTRACTOR shall be responsible for erecting and maintaining barricades and other traffic warning devices as necessary around the perimeter of construction and adjacent to any open trenches. Provide and maintain adequate detours around the work under construction. Provide sufficient lights, warning signs, and watchmen for the safety of the public.
3. Any temporary street closure shall be coordinated with and approved by the AHJ. CONTRACTOR shall establish all detour routes while streets are closed during construction. CONTRACTOR shall notify Fire, Police, and EMSA headquarters when any street is temporarily closed.
4. CONTRACTOR is responsible for the prompt replacement and/or repair of all traffic control devices and appurtenances damaged or disturbed due to construction. Any existing traffic signals, signal loops, conduits, cables, and other traffic control devices affected by the work shall be reset or replaced according to AHJ's specifications. Coordinate the work with the AHJ's traffic department.

B. ENVIRONMENTAL CONDTIONS

1. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 PRODUCTS

2.01 PARKING BUMPERS

A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 3000-psi (28-day) minimum compressive strength, 5-1/2 inches high by 8 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or drilled vertical holes through wheel stop for anchoring to substrate.

B. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.

C. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter, 10-inch minimum length or hardware as standard with wheel-stop manufacturer.

2.02 PAVEMENT MARKINGS

A. Performance Requirements

1. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

B. Pavement Marking Paint

1. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
   a. Colors: White, Yellow, Blue, and Red.

2.03 PREFORMED TRAFFIC-CALMING DEVICES

A. Speed Bumps: Solid, integrally colored, 96 percent postconsumer or commingled postconsumer and pre-consumer recycled rubber or plastic; UV stabilized. Provide factory-formed or -drilled vertical holes for anchoring to substrate.

1. Size: 2 inches high by 10 inches wide by 72 inches long; with tapered, square, or rounded ends.
2. Size: Modular assembly 3 inches high by 12 feet in overall width, with overall length as dimensioned on Drawings; and with tapered, square, or rounded ends.
3. Color: Black.
4. Embedded Markings: Molded-in, yellow reflective markings, permanently inset in exposed surface.
5. Mounting Hardware: Galvanized-steel lag screw, shield, and washers; 1/2-inch diameter, 8-inch minimum length or hardware as standard with device manufacturer.
6. Adhesive: As recommended by device manufacturer for adhesion to pavement.

PART 3 EXECUTION

3.01 PARKING BUMPERS

A. EXAMINATION

1. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION

1. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.
2. Install wheel stops in bed of adhesive before anchoring.
3. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

3.02 PAVEMENT MARKINGS

A. EXAMINATION

1. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
2. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

B. APPLICATION

1. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
2. Allow paving to age for a minimum of 30 days before starting pavement marking.
3. Sweep and clean surface to eliminate loose material and dust.
4. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
    a. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

C. FIRE LANES

1. Where fire lines are indicated, a 6-in wide red stripe with 4-inch high white letters with a 3/4-inch stroke stating, “FIRE LANE NO PARKING” shall be provided showing the boundary of the fire lane. The words “FIRE LANE NO PARKING” must be grouped together as a phase. The phrase shall be painted a maximum distance of every 40 feet C-C along the length of the fire lane. When a curb is along the fire lane, the face and top of the curb shall be painted with the phrase painted on the face of the curb.

D. PROTECTING AND CLEANING

1. Protect pavement markings from damage and wear during remainder of construction period.
2. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.03 PREFORMED TRAFFIC-CALMING DEVICES

A. EXAMINATION

1. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION

1. General: Install manufactured traffic-calming devices according to manufacturer's written instructions unless otherwise indicated.
2. Install devices in bed of adhesive before anchoring.
3. Securely anchor devices to pavement with hardware spaced as recommended in writing by manufacturer for heavy traffic. Recess head of hardware beneath top surface of device.

END OF SECTION 32 1700